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PREFACE

This revision of the United States Pharmacopœia reflects a period of intensive medical development supported by scientific research of a high order and stimulated by the demands of a global war.

Never before was so much consideration nor so great an opportunity given medical and the allied sciences to demonstrate what could be done to maintain the health of troops and citizens under varied climatic and other adverse conditions. Especially was the effort made to restore to health and efficiency those wounded in battle.

Even before the United States entered the war this country felt the consequences of the European conflict and the Pharmacopœia moved promptly to alter formulas when wartime shortages made this necessary, and also to provide controls for important new drugs, the value of which had been quickly proved under war conditions and for which the Army and Navy were asking adequate standards.

Continuous Revision—A new Pharmacopœia, the Twelfth Revision, became official in 1942, but within two years six Sheet Supplements had been issued and by 1944 the First U. S. P. XII Bound Supplement, carrying 34 new drugs and preparations and about 175 other revisions was necessary. Subsequently other urgent changes were required and during this revision period of about four years, eleven Sheet Supplements were required to meet changing conditions. This experience has demonstrated the wisdom of the continuous revision plan and the flexibility and adaptability of pharmacopœial standards thereunder.

Admissions—The scope policy established in 1820 for the first United States Pharmacopœia has been meticulously maintained and an effort made to restrict the admissions to the Thirteenth Revision to those therapeutically active agents, germicides, anesthetics, diagnostic agents, and other necessary medical aids, which reflect the best state of medical knowledge of today, and to the preparations of these whereby they may be most efficiently administered or used. Substances required for the manufacture of preparations are also included and standardized.

English Titles—The change in title arrangement in this revision of the Pharmacopœia was authorized by the members of the Committee of Revision after extensive discussion. For the first time in the U. S. Pharmacopœia the English titles occupy the leading position and determine the alphabetical arrangement of monographs. Latin titles are, of course, retained. With the basic therapeutic agents now arranged in alphabetical order, it is possible to follow each drug with its prepara-

tions and it is, therefore, unnecessary to list dosage forms in a special paragraph under the respective drugs. This has required a minor modification in some titles such as a change from "Tincture of Digitalis" to "Digitalis Tincture."

Coupon—The coupon placed on the back of the title page bears the identifying number of the Pharmacopœia and makes it an official copy.

Official Date—The Board of Trustees has announced April 1, 1947, as the date when the standards of the Thirteenth Revision shall supersede those of the U. S. P. XII. This decision is a responsibility of the Board through the Constitution and By-Laws of the U. S. P. Convention.

Supplements—An order form for a First U. S. P. XIII Bound Supplement will be found inside the back cover of the Pharmacopœia. If and when a Bound Supplement to the U. S. P. XIII is announced in the press, those owning a copy of the Thirteenth Revision may obtain a copy of the Supplement, without charge, by completing and mailing this order card to the Pharmacopœia office. Order cards should not be mailed previous to the appearance of the release announcement in the press. From time to time U. S. P. Sheet Supplements representing emergency changes in standards may be announced in the press, and copies may be obtained from the U. S. P. office.

Reference Standards—The Reference Standards program has had a notable expansion within recent years and is now under the supervision of a special committee. All tests and checks on Standards are reported in full to this committee and if approved are placed before the General Committee of Revision for acceptance and before the Board of Trustees for release. A public record is thereby established for U. S. P. Reference Standards, such Standards being used frequently as the basis for action in court. A list of Reference Standards will be found on page 682.

Assistance in Revision—The Committee of Revision has again been able to obtain invaluable assistance from many organizations and individuals who have voluntarily offered help in the numerous problems of revision which call for special knowledge and superior technical skill. Subcommittee Chairmen have had liberal support from the colleges or institutions with which they have been associated, especially through the furnishing of extensive office and laboratory facilities for experimental purposes. This help has made unnecessary the establishment of pharmacopœial laboratories which would be difficult to staff with directors of an efficiency equal to those available through voluntary service, and which could be maintained only by a very large expenditure.

The formally appointed advisory Boards and Committees, composed

of nationally known experts in specific fields, such as vitamins, hormones, anti-anemia products, sterile materials, including injections, preparations of amino acids, etc., have provided the Pharmacopœia with the necessary guidance for these important standards.

With the expansion of the program of co-operation in Pharmacopœia revision, whereby a broad public platform is provided for discussion by all interested groups, the Revision Committee and especially Subcommittee Chairmen have served as unbiased, judicial groups for deciding the ultimate standards and methods to be adopted by the Pharmacopœia.

The extensive collaborative studies of specific problems, which have become an absolute necessity in modern revision work, have been made possible through the assistance of many groups. The various divisions of the Food and Drug Administration, especially in the fields of vitamins, biological and chemical assays, and sterile products, and those responsible for biological products, arsenicals, and blood substitutes in the National Institute of Health, have been of constant help.

The officers of the Council on Pharmacy and Chemistry and of the laboratory of the American Medical Association, especially through suggested tests for new products appearing in the New and Non-official Remedies, also the Journals and the directors of the laboratory of the American Pharmaceutical Association, have brought much mutual help to the U. S. P. and N. F. Revisions.

The members of the Contact Committees of the American Drug Manufacturers' Association and the American Pharmaceutical Manufacturers' Association have brought a form of check which has the merit of both testing the practicability of assays and at the same time training personnel who will subsequently be required to control the quality of manufactured products.

Of special significance has been the close co-operation of the Department of National Health and Welfare of Canada. This has brought a highly trained group of associates to the work of revision, and has brought about uniformity in many standards between the two countries.

The experts of the Insulin Committee of the University of Toronto and the manufacturers of Insulin have aided in the establishment of adequate standards for the various forms of Insulin.

The Atomic and Molecular Weight Table has expanded throughout the years as new products have come into use and has become increasingly valuable and important. In this Revision it has been greatly extended and completely revised so that the formulas are uniform in style and represent modern conceptions as to form. This revised table has

been a voluntary contribution by C. T. Van Meter and J. A. Bianculli to whom the Pharmacopœia is greatly indebted.

While all members of the Revision Committee have assisted loyally in the intensive work of revision, which has become very arduous with the establishment of the "continuous revision" program, the Chairman is especially indebted to Joseph Rosin and George D. Beal for their continuous and highly technical assistance throughout the revision, including the consideration of the voluminous suggestions in the chemical field received from proofreaders. Recognition is due many others who have contributed essential services during this strenuous war period. Highly important help has been given by W. B. Castle in handling the anti-anemia program, continuous aid came in the biological field from Erwin E. Nelson and Lloyd C. Miller, the statistical aid from C. I. Bliss and Lila F. Knudsen was a vital new service, the special digitalis colorimetric assay studies by John C. Krantz, Jr. and Frederick K. Bell, and by Arthur E. James and F. O. Laquer, promise outstanding developments, and the advice and assistance of Louis Gershenfeld in handling sterile products was constructive and valuable.

The close co-operation of Justin L. Powers, Chairman of the National Formulary Committee of Revision and a member of the U. S. P. Committee, has been one of the most gratifying features of the revision period. Through this helpful and understanding relationship these two official books of standards have been able to develop uniform methods in related fields and establish a splendid spirit of united service.

Special recognition and appreciation are due many others and an attempt has been made to list (on pages xv and xvi) those who helped. However, it is impossible to know all who gave assistance as associates and helpers or to avoid missing others who should have been named.

The Chairman wishes to acknowledge gratefully the loyal and able help of Adley B. Nichols, his personal assistant, in every phase of the work of revision. Through his work as Secretary to the Board of Trustees, Professor Nichols has also made an outstanding contribution to the Pharmacopœial program.

The Chairman also wishes to express his personal appreciation to the group of workers in the Pharmacopœia office. They have remained at their posts through the trying years of the war and skilfully and loyally supported the increasingly complex program.

E. Fullerton Cook

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R. I. Grantham, Philadelphia, Pa.
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Louis Greenberg, Ottawa, Canada
Arthur Grollman, Dallas, Tex.
†Earl P. Guth, Columbus, Ohio
C. H. Hampshire, London, England
†J. W. E. Harrisson, Philadelphia, Pa.
Sir Percival Hartley, London, England
†F. Howard Hedger, Brooklyn, N. Y.
Henry W. Heine, Lafayette, Ind.
C. Henze, New York, N. Y.
R. P. Herwick, Washington, D. C.
†F. L. Hilbert, New York, N. Y.
†Albert F. Hill, Cambridge, Mass.
S. J. Hill, Wilmington, Del.
†L. D. Hiner, Columbus, Ohio
†J. Hampton Hoch, Charleston, S. C.
George M. Hocking, Buffalo, N. Y.
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*A. C. Hunter, Washington, D. C.
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David Klein, Chicago, Ill.
O. L. Kline, Washington, D. C.
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Lila F. Knudsen, Washington, D. C.
Roy Koch, New York, N. Y.
R. A. Kuever, Iowa City, Iowa
M. H. Kuizenga, Kalamazoo, Mich.

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* Deceased.
† Auxiliary Members of Subcommittees.
‡ Assistant to chairman, Subcommitee No. 7.

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†J. P. LEAKE, Washington, D. C.
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B. A. LINDEN, Washington, D. C.
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THE HISTORY OF THE UNITED STATES PHARMACOPŒIA

IN January, 1817, Dr. Lyman Spalding,* of New York City, submitted to the Medical Society of the County of New York a project for the formation of a National Pharmacopœia.†

Doctor Spalding's plan was as follows: The United States was to be divided into four districts—Northern, Middle, Southern, and Western; the New England States to form the Northern District; New York, New Jersey, Pennsylvania, Delaware, Maryland, and the District of Columbia, the Middle District; and the States south and west of these borders to constitute the other two districts.

The plan provided that a Convention should be called in each of these districts, to be composed of delegates from all the medical societies and schools situated within each of them. Each District Convention was to form a Pharmacopœia, and appoint delegates to a General Convention, to be held in Washington, D. C. To this General Convention the four

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* Born at Cornish, N. H., June 5, 1775; died at Portsmouth, N. H., October 30, 1821.

† While European Pharmacopœias were chiefly relied upon as authorities previous to the appearance of the first official Pharmacopœia of the United States of America, yet a few works had appeared, previous to this time, which deserve to be recorded here.

In 1778 there was published at Philadelphia a small Pharmacopœia for the use of the Military Hospital of the U. S. Army located at Lititz, Lancaster Co., Pennsylvania, under the title: "Pharmacopœia simpliciorum et efficaciorum, in usum nosocomii militaris, ad exercitum fœderatarum *Americæ* civitatum pertinentis; hodiernæ nostræ inopiæ rerumque angustiis, feroci hostium sævitiæ, belloque crudeli ex inopinato patriæ nostræ illato debitis, maxime accommodata." A second edition of this appeared in 1781, on the title page of which Dr. William Brown is mentioned as author.

On October 3, 1805, the Counsellors of the Massachusetts Medical Society appointed a Committee to draft a Pharmacopœia adapted to the special wants of their section of this country. The Committee, consisting of Dr. James Jackson and Dr. John C. Warren, endeavored to secure the co-operation of medical institutions in other States, with the object of making the work national, but without success. They presented the result of their labors to the Counsellors on June 5, 1807, and the work was issued some time in the early part of 1808. It was based upon the last preceding edition of the Edinburgh Pharmacopœia, but contained much original matter, among which was a posological and prosodial table.

In 1815 the Physicians and Surgeons of the New York Hospital appointed Dr. Samuel L. Mitchill and Dr. Valentine Seaman a Committee to prepare a Pharmacopœia for the use of that institution. This was issued in 1816, and enjoyed for some years an authority of more than local character.

District Pharmacopœias should be taken, and from the material thus brought together a National Pharmacopœia should be compiled. Doctor Spalding's plan was approved by the committee to which it was referred, and subsequently, through the agency of the Medical Society of the State of New York, it was carried into effect. This society issued circulars requesting the co-operation of the several incorporated State Medical Societies, the several incorporated Colleges of Physicians and Surgeons, or Medical Schools, or such medical bodies as constituted a faculty in any incorporated university or college in the United States; and in any State or Territory in which there was no incorporated medical society, college, or school, voluntary associations of physicians and surgeons were invited to assist in the undertaking.

The following organizations approved the plan of forming a National Pharmacopœia, and appointed delegates to district conventions: Massachusetts Medical Society, June 2, 1818; College of Physicians and Surgeons in the City of New York, June 25, 1818; Medical and Chirurgical Faculty of Maryland, June, 1818; Rhode Island Medical Society, September 1, 1818; Medical Society of South Carolina, September, 1818; Medical Society of the District of Columbia, October 5, 1818; Connecticut Medical Society, October 15, 1818; Medical Institution of Yale College, October 28, 1818; Vermont Medical Society, October, 1818; Board of Physicians and Surgeons of the First Medical District of the State of Indiana, November 3, 1818; College of Physicians and Surgeons of the Western District of the State of New York, January, 1819; College of Physicians of Philadelphia, February 2, 1819; Medical Faculty of Brown University, March 15, 1819; Medical School at Lexington, Kentucky, April, 1819; New Hampshire Medical Society, May 5, 1819; Medical Society of New Jersey, May 11, 1819; Medical Society of the State of Delaware, May, 1819; Medical Society of Georgia, May, 1819.

The Medical College of Ohio and the Medical Society of New Orleans approved the formation of a National Pharmacopœia, but they did not appoint delegates.

The District Convention for the New England States was held in Boston, June 1, 1819, and a District Pharmacopœia was adopted.

The District Convention of the Middle States was held in Philadelphia, June 1, 1819, and two outlines of Pharmacopœias, submitted by the delegates from New York and Philadelphia, were formed into one, which was adopted as the Pharmacopœia of the Middle District.

There were no conventions held in the Southern and Western Districts, but measures were taken, by those concerned, to secure a representation

of the Southern District in the General Convention at Washington. The General Convention for the formation of a National Pharmacopœia assembled in the Capitol, at Washington, January 1, 1820, and elected Samuel L. Mitchill, M.D., President, and Thomas T. Hewson, M.D., Secretary.

The two Pharmacopœias prepared in the Northern and Middle Districts were submitted to examination, compared in detail, and their contents, with such additions as were thought necessary, consolidated into one work, which, after full revision, was adopted by the General Convention, and ordered to be published by a committee appointed for that purpose, of which Dr. Lyman Spalding was chairman. It was published in Boston, December 15, 1820, in both the Latin and English languages, a second printing appearing in 1828.

FIRST REVISION

Before adjourning, the General Convention of 1820 made arrangements for the future revision of the work. It instructed its President to issue, on January 1, 1828, writs of election to the several incorporated State Medical Societies and incorporated Medical Colleges and Schools in the Northern District, requiring them to ballot for three delegates to a General Convention to be held at Washington on January 1, 1830, for the purpose of revising the American Pharmacopœia; and that these several institutions be requested to forward to the President, on or before April 1, 1829, the names of three persons thus designated by ballot.

The President of the Convention was requested, on the said day, to assort and count the said votes, and to notify the three persons, who should have the greatest number of votes, of their election. In case there should not be three persons who had a greater number of votes than others, then the said President was desired to put a ballot into the box for each of those persons who had an equal number of votes, and draw therefrom such number of ballots as should make the number of delegates three, and notify as before directed.

This resolution was to apply in like manner to the Middle, Southern, and Western Districts.

Accordingly, there were to be three delegates from each of the four districts, the Convention thus to consist of twelve delegates.

Notwithstanding the care thus exercised by the Convention of 1820 to arrange for a Convention in 1830, a serious misunderstanding occurred, the result of which was that two Pharmacopœias were published in 1830—one in New York and one in Philadelphia.

The President issued, on January 1, 1828, writs of election, as instructed by the Convention of 1820; but, on account of a certain ambiguity of expression in the resolution of the Convention of 1820, and perhaps, also, in the communication of President Mitchill addressed to the various societies and colleges, some of the organizations did not correctly understand what was expected of them, and instead of sending to President Mitchill the state of the ballot, forwarded to him merely its result. It appears to have been the impression in many places that the societies addressed were to choose delegates, and that the delegates thus chosen were to proceed to Washington.

President Mitchill received returns from the Northern and Middle Districts, but none from the Southern and Western Districts. He counted the ballots returned to him, as he understood that they should be counted, and notified the three delegates chosen by each of the two districts of their election, but the appointment of the delegates for the Middle District was not satisfactory to many of the medical societies of that region.

The delegates from the Northern and Middle Districts who had been notified by President Mitchill of their election resolved, by general concurrence, and for the sake of convenience, to hold the meeting of the Convention at New York instead of Washington, as directed by the authority under which they were chosen. Eli Ives, M.D., of Yale College, Connecticut, was elected President. As they were so few in number, they adjourned for six months in order to obtain assistance from the medical fraternity of the country. They issued a circular to each of the Medical Societies and Medical Institutions in the United States not represented in the Convention, requesting each to appoint a delegate to co-operate with this Convention in revising the American Pharmacopœia. Provided no delegate should be appointed, or, if appointed, should be unable to attend, said society or medical institution or delegates were requested to communicate their ideas, in relation to the revision of the Pharmacopœia, to the Convention at their next session to be held on the first Wednesday of June, 1830, at the College of Physicians and Surgeons of New York.

The Convention met, according to agreement, in New York, June 2, 1830, ten delegates being present, representing Connecticut, South Carolina, New York, Ohio, and Western Massachusetts. They revised the Pharmacopœia of 1820, authorized the publication of their revision, and, before adjourning, provided for a subsequent revision in 1835. The book was published in New York, November, 1830.

In consequence of the dissatisfaction existing in the Middle District, arrangements were made to hold a Convention at Washington, in January, 1830, which should be more fairly representative of the medical societies, colleges, and schools of the Middle District.

The Convention was held in the Capitol, at Washington, January 4, 1830. It consisted of eight delegates, two from New Jersey, two from Philadelphia, one from Delaware, one from Maryland, and two from the District of Columbia, all members from the Middle District. Lewis Condict, M.D., of New Jersey, was elected President.

Since many sections of the United States were not represented at this Convention, and it appeared desirable that the various medical interests of the country should have their due representation, it was resolved, soon after the organization of the Convention, that the Surgeon-General of the Army, the senior surgeon of the Navy, stationed at Washington, and those Members of Congress who were practitioners of medicine, should be invited to participate in the proceedings.

In compliance with this invitation, the Surgeon-General of the Army, the senior surgeon of the Navy, and three Members of Congress took their seats in the Convention, thus increasing the number of delegates to thirteen. The Convention appointed a Committee of Revision consisting of a Chairman and two members from each of the following cities, *viz.:* Boston, New York, Philadelphia, Baltimore, Washington, Charleston, Lexington, and Cincinnati.

The Chairman of the Committee was requested to open correspondence with the several members for the purpose of submitting to their examination a revised draft of the Pharmacopœia presented to the Convention by the delegates from Pennsylvania. He was also instructed to call a meeting of the Committee in Philadelphia. Any three members were constituted a quorum for the transaction of business, and, after a careful examination of the several communications that might be submitted to them, they were to prepare a revised edition of the Pharmacopœia, and make the necessary arrangements for its publication.

The Committee performed the duty imposed upon it, and its revision of the Pharmacopœia was published in Philadelphia in 1831.

SECOND REVISION

Previous to adjournment, the Washington Convention arranged for a Convention in 1840, by the following resolution: "*Resolved,* That the President of this Convention shall, on the first day of January, 1839, issue a notice, requesting the different incorporated State Medical

Societies, the incorporated Medical Colleges, and the incorporated Colleges of Physicians and Surgeons, throughout the United States, each to elect a number of delegates, not exceeding three, to attend a General Convention to be held at Washington, D. C., on the first Monday in January, 1840."

The plan of the New York Convention for a revision of the Pharmacopœia in 1835 was abandoned. The plan of the Washington Convention for a revision in 1840 was generally recognized as the more feasible and was fully carried out.

The notices for the choice of delegates to the Convention of 1840 were issued by Lewis Condict, M.D., President of the Washington Convention of 1830, in accordance with the resolution quoted above. The Convention assembled at Washington on the first day of January, 1840, twenty delegates being present, representing the Rhode Island Medical Society, the New Jersey Medical Society, the College of Physicians of Philadelphia, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the Delaware Medical Society, the Washington University of Baltimore, the Medical and Chirurgical Faculty of Maryland, the Medical Society of the District of Columbia, the Columbian Medical College, the Vincennes Medical Society of Indiana, and the Medical Society of Georgia.

The credentials of delegates from the Medical Society of Vermont, the Medical Society of New Hampshire, the Albany Medical College, and the College of Physicians and Surgeons of Lexington, Kentucky, were presented, but the delegates did not appear during the session. Lewis Condict, M.D., of New Jersey, was elected President.

With the view of giving the various medical interests of the country proper representation in the Convention, the Surgeon-General of the Army and the senior surgeon of the Navy, stationed at Washington, were invited to participate in the proceedings. The Convention appointed a Committee of Revision and Publication, consisting of seven members (three to form a quorum), and the meetings of the Committee were to be held at Philadelphia. To this Committee were referred all communications received by the Convention from the various organizations represented. The Committee was authorized to request the co-operation of the colleges of pharmacy in the United States, and to publish the work after the completion of the revision. Valuable assistance was rendered the Committee by the Colleges of Pharmacy of Boston and New York; the Philadelphia College of Pharmacy presented a complete revised copy of the Pharmacopœia, elaborated with ability and great

industry. The Committee accepted, after deliberate examination, nearly all of the suggestions, and this caused delay in the issue of the work. The book was not published until early in the year 1842. In this revision the Latin version was omitted. The process of displacement or percolation was introduced for the first time.

THIRD REVISION

Before adjourning, provision was made, by the following resolution, for a Convention in 1850:

"The President of this Convention shall, on the first day of May, 1849, issue a notice, requesting the several incorporated State Medical Societies, the incorporated Medical Colleges, the incorporated Colleges of Physicians and Surgeons, and the incorporated Colleges of Pharmacy, throughout the United States, each to elect a number of delegates, not exceeding three, to attend a General Convention to be held at Washington, on the first Monday in May, 1850."

In accordance with this resolution, the Convention met at Washington, May 6, 1850, thirty delegates being present, representing: the Rhode Island Medical Society, the Geneva Medical College, the College of Pharmacy of the City of New York, the Medical Society of New Jersey, the College of Physicians of Philadelphia, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the Medical Faculty of the Pennsylvania College, the Medico-Chirurgical College of Philadelphia, the Philadelphia College of Pharmacy, the Medical Society of Delaware, the Medical and Chirurgical Faculty of Maryland, the Medical Society of the District of Columbia, the National Medical College of the District of Columbia, the Medical Department of the National Institute, the Georgetown Medical College, and the Rush Medical College of Chicago.

The credentials of delegates from the New Hampshire Medical Institution, the University of Buffalo, the Medical Department of Hampden-Sidney College, the Medical Society of South Carolina, the Medical College of Ohio, the Cincinnati College of Pharmacy, the Missouri Medical Society, the Wisconsin State Medical Society, and the Medical Faculty of the University of Iowa were presented, but the delegates did not appear during the session.

George B. Wood, M.D., of Philadelphia, was chosen President. The Surgeon-General of the Army and the Chief of the Bureau of Medicine and Surgery of the Navy Department were invited to participate in the proceedings.

The Convention appointed a Committee of Revision and Publication, consisting of the President of the Convention and three other members, three to form a quorum; the meetings of the Committee were held in Philadelphia, and the Committee published the revised work in 1851. A second edition was issued in 1855.

FOURTH REVISION

Before adjourning, the Convention of 1850 made arrangements for a Convention to be held on the first Wednesday in May, 1860, by a resolution similar to the one adopted by the Convention of 1840.

The Convention met in 1860, thirty delegates being present, representing: the Maine Medical Association, the Massachusetts Medical Society, the Massachusetts College of Pharmacy, the Connecticut State Medical Society, the Medical Society of the State of New York, the New York Academy of Medicine, the College of Pharmacy of the City of New York, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the College of Physicians of Philadelphia, the Philadelphia College of Pharmacy, the Delaware State Medical Society, the University of Maryland, the Maryland College of Pharmacy, the National Medical College of Washington, the Medical Society of the District of Columbia, the United States Army, and the United States Navy. George B. Wood, M.D., of Philadelphia, was chosen President.

A Committee of Revision and Publication was appointed, consisting of nine members, including the President of the Convention. To this Committee were referred all communications relating to the revision of the Pharmacopœia. Three members were to form a quorum. The Committee was to meet in Philadelphia, and was authorized to publish the work after its revision. The book was published in June, 1863. Before adjourning, the Convention made arrangements, by a resolution similar to that adopted by the Convention of 1850, for a Convention in 1870.

FIFTH REVISION

In accordance with this resolution, a Convention met in Washington, Wednesday, May 4, 1870, sixty delegates being present, representing: the St. Louis Medical College, the Maryland College of Pharmacy, the Missouri Medical College, the St. Louis College of Pharmacy, the Chicago College of Pharmacy, the Medical Society of the District of Columbia, the Medical College of Virginia, the Massachusetts College of Pharmacy, the Medical Society of the State of New York, the College

of Physicians of Philadelphia, the College of Pharmacy of the City of New York, the National Medical College of Washington, the University of Pennsylvania, the Jefferson Medical College of Philadelphia, the Philadelphia College of Pharmacy, the College of Pharmacy of Baldwin University, the Medico-Chirurgical Society of Louisville, the Baltimore Medical Association, the Medical Department of Georgetown College, the Washington University of Baltimore, the Massachusetts Medical Society, the Maine Medical Association, the University of Buffalo, the Medical and Chirurgical Society of Maryland, the Baltimore Medical Association, the University of Nashville, the University of Maryland, the Pharmaceutical College of Howard University, the University of Virginia, and the Woman's Medical College of Philadelphia.

Such Members of Congress as were graduates of regular medical schools, the Surgeon-General of the Army, and the Chief of the Bureau of Medicine and Surgery of the Navy Department were invited to take seats in the Convention and participate in its deliberations. Joseph Carson, M.D., of Philadelphia, was elected President of the Convention.

A Committee of Revision and Publication, consisting of fifteen members, was appointed and given definite instructions as to the general plan to be followed in revising the Pharmacopœia.

A resolution was adopted directing "that measures of capacity be abandoned in the Pharmacopœia, and that the quantities in all formulas be expressed in weights and in parts by weight." The Committee of Revision, by a unanimous vote, decided that the adoption of the principle of parts by weight was impracticable, and definite weights and measures were used in the Pharmacopœia.

Before adjourning, it was resolved that the rules adopted by the Convention of 1860, for the meeting of 1870, be adopted for the Convention of 1880, simply changing the dates.

The Fifth Revision of the Pharmacopœia was published in 1873.

SIXTH REVISION

The next Convention assembled on May 5, 1880, at Washington. There were one hundred and nine delegates accredited from ten Medical Societies, twenty-three Medical Colleges, eleven Pharmaceutical Colleges, and the Medical Departments of the Army, the Navy, and the Marine Hospital Service. Seventy-five delegates attended the meeting. Dr. Robert Amory, of Boston, was elected President of the Convention.

Important changes were directed at this meeting to be made in the Pharmacopœia, the more prominent ones being the following: all articles

were to be arranged in alphabetical order; a new chemical nomenclature was to be introduced; quantities were to be stated in "parts by weight," and descriptions of crude drugs and of chemicals were to be made more comprehensive and exact. Numerous tables were also directed to be added to the work. A Committee of Revision was elected, consisting of twenty-five members, and its powers and duties were expressly defined.

Regarding the call to be issued for the Convention of 1890, it was resolved that the President of the Convention of 1880 should, on or about the first day of May, 1889, issue a notice requesting the several incorporated Medical Societies, the incorporated Medical Colleges, the incorporated Colleges of Pharmacy, the incorporated Pharmaceutical Societies throughout the United States, the American Medical Association, and the American Pharmaceutical Association, each to elect a number of delegates, not exceeding three; the Surgeon-General of the Army, the Surgeon-General of the Navy, and the Surgeon-General of the Marine Hospital Service, each to appoint not exceeding three medical officers to attend a General Convention for the Revision of the Pharmacopœia of the United States, to be held in Washington, D. C., on the first Wednesday of May, 1890.

It was also resolved that the several bodies, as well as the Medical Departments of the Army, the Navy, and the Marine Hospital Service, thus addressed, should also be requested by the President to submit the Pharmacopœia to a careful revision and to transmit the result of their labors, through their delegates, to the Committee of Revision, at least three months before the meeting of the Convention.

The several medical and pharmaceutical bodies were further to be requested to transmit to the President of the Convention of 1880 the names and residences of their respective delegates, as soon as they had been appointed; a list of whom was to be published, under his authority, for the information of the medical public, in the newspapers and medical journals, in the month of March, 1890.

Finally, it was resolved that in the event of the death, resignation, or inability of the President of the Convention to act, these duties should devolve successively, in the following order of precedence: upon the Vice-Presidents, the Secretary, the Assistant Secretary, and the Chairman of the Committee of Revision and Publication of the Pharmacopœia.

The Sixth Revision of the Pharmacopœia was published at the close of October, 1882.

SEVENTH REVISION

In accordance with the instructions of the Convention of 1880, the Convention for the Seventh Decennial Revision of the Pharmacopœia of the United States of America met on May 7, 1890, in the City of Washington, one hundred and seventy-five delegates being present, representing: the Medical Departments of the United States Army, the United States Navy, the United States Marine Hospital Service, and fifteen Medical Societies or Associations, twenty-three Medical Colleges and Universities, twenty-five Pharmaceutical Associations, and twenty-three Colleges of Pharmacy and Universities.

Dr. Horatio C. Wood, of Philadelphia, was elected President.

It was recommended by the Convention that assay processes should be appended to the United States Pharmacopœial descriptions of the energetic or otherwise important drugs, and to such galenical preparations as the Committee of Revision of the Pharmacopœia should deem wise, especial care being taken that the assay processes for opium and cinchona should be attended with as little manipulative difficulty as possible; that the standard of purity for drugs should not be above the point of practicability; that the strength of official tinctures and wines should be ten per cent as far as advisable in the judgment of the Committee; that no substances protected by proprietary rights, or produced solely under a patented process, should be introduced into the Pharmacopœia.

In regard to weights and measures, the principle of parts by weight was abandoned, and the Committee of Revision was instructed to direct solids to be weighed and liquids to be measured, except in those cases in which the Committee should find it advisable to use weights only; also, that the metric system should be employed.

The Committee of Revision, consisting of twenty-six members, who were elected by the Convention, proceeded to revise the Pharmacopœia in accordance with their instructions.

Before its adjournment, the Convention for the Revision of the United States Pharmacopœia directed that the President of this Convention "shall, on or about the first day of May, 1899, issue a notice requesting the several bodies represented in the Conventions of 1880 and 1890, and also such other incorporated State Medical and Pharmaceutical Associations, and incorporated Colleges of Medicine and Pharmacy, as shall have been in continuous operation for at least five years immediately preceding, to elect a number of delegates, not exceeding three, and the Surgeon-General of the Army, the Surgeon-General of the Navy, and

the Surgeon-General of the Marine Hospital Service, each to appoint not exceeding three medical officers, to attend a General Convention for the Revision of the Pharmacopœia of the United States, to be held in Washington, D. C., on the first Wednesday of May, 1900."

The Seventh Revision of the United States Pharmacopœia was published in September, 1893, and became official January 1, 1894.

EIGHTH REVISION

The Eighth Decennial Convention for revising the Pharmacopœia met in Washington, D. C., May 2, 1900, the President, Horatio C. Wood, presiding. Delegates were present, representing twenty-eight states, the District of Columbia, and the Army, Navy, and Marine Hospital Service. Following the address of the President, a report from the Chairman of the Committee of Revision, Joseph P. Remington, the adoption of "General Principles," and other routine business, a Board of Trustees and a Committee of Revision of twenty-five members were elected, the President of the Convention being a member ex-officio.

The Eighth Revision differed from previous revisions in the fact that the business management was entrusted to a Board of Trustees and the Committee of Revision was thus afforded more time to devote to the immediate duties of revision. On July 7, 1900, a Charter with articles of incorporation was issued by the District of Columbia to the United States Pharmacopœial Convention, with a view of giving greater stability to the organization (see page xlii).

By far the most important occurrence in connection with the Pharmacopœia was the passage of an Act by the Congress of the United States, entitled the Food and Drugs Act, June 30, 1906. The standards adopted under this Act were those of the United States Pharmacopœia and the National Formulary. Up to the time of the passage of this Act the standards of the United States Pharmacopœia were not compulsory, except in a very few instances. Some of the State Legislatures followed the action of the Federal Government and passed laws of similar import. The passage of this legislation *compelled* official preparations to be made in accordance with the requirements of the standards of the United States Pharmacopœia, and a far greater interest was taken in these standards in all parts of the country.

In September, 1902, there was held in the City of Brussels an important conference, entitled "Conférence Internationale pour l'Unification de la Formule des Médicaments Héroïques," which was composed of delegates from nearly every civilized country. The purpose of this body

was to endeavor to formulate standards for *potent remedies* which would be adopted by the various pharmacopœias of the world, and thus there would be secured the principal object of an international pharmacopœia. The recommendations of this conference were adopted by the Committee of Revision, except in one or two instances. This made necessary a number of changes in the strength of important official preparations.

The purity rubric was first established in the Eighth Revision, the object being explained as follows: "The necessity for more accurately defining the limit of purity permissible in official chemical substances has been apparent for many years. In the Sixth Decennial Revision this question was met by inserting more definite descriptions with qualitative and quantitative tests. In the Seventh Revision will be found a still greater elaboration of this plan. In the present revision there has been added what has come to be known as the purity standard, or purity 'rubric,' which is placed in large type immediately before the description, and which defines the percentage of small quantities of permissible, innocuous impurities which do not materially affect medicinal action or interfere with pharmaceutical uses. It is believed that this plan will enable the reader to ascertain at a glance the standard which has been adopted, and which represents what the Committee believes to be obtainable, and which, on the other hand, will not prove burdensome or impossible for the manufacturer to produce without adding unnecessary and excessive cost to the consumer."

An advance was made in the Eighth Revision by increasing the number of proximate assays and the processes were made more efficient. Serum products were introduced because of their growing importance.

The long continued custom of designating United States Pharmacopœias by the decennial periods of their revision was dropped, and they were designated by the number of revisions; instead of U. S. P. 1900, which was not issued until 1905, it was called simply the "Eighth Decennial Revision."

Average doses which were not intended to be compulsory, but which were to act as a guide in the administration of medicines, were appended under medicinal articles.

The Eighth Revision became official from September 1, 1905, but some additions and corrections were necessary on account of the passage of the Food and Drugs Act.

General tests for heavy metals and arsenic which would apply to many chemical substances throughout the text were inserted under the head of "General Tests" in the Appendix.

A Digest of Comments was authorized in this revision and the work was done under the supervision of the Public Health and Marine Hospital Service.

A Spanish translation of the Eighth Revision of the United States Pharmacopœia, prepared in 1909, was received with much satisfaction in the Spanish-speaking countries of the Americas.

NINTH REVISION

The members of the U. S. Pharmacopœial Convention of 1910 consisted of the four incorporators who were living, the officers of the Convention of 1900, the Board of Trustees, the Committee of Revision of 1900–1910, and two hundred and eighty registered delegates from thirty-eight states, eighteen from seven national organizations, and twelve delegates from the Government, representing the Surgeon-General's office, United States War Department; Bureau of Medicine and Surgery, United States Navy Department; Bureau of Public Health and Marine Hospital Service, United States Treasury Department; and the United States Department of Agriculture.

Owing to the illness of Dr. Horatio C. Wood, President of the United States Pharmacopœial Convention, and the death of Albert B. Prescott, First Vice-President of the organization, Dr. Otto A. Wall, the Second Vice-President, presided over the Ninth Decennial Convention which assembled in Washington, D. C., May 10, 1910.

The Eighth Revision had been adopted as a standard under the Food and Drugs Act of June 30, 1906; this, and recognition in other national and state legislation, enlarged the scope of the Pharmacopœia and gave even greater significance to the Ninth Revision. The former revision became a legal standard after its publication. In the Ninth Revision this obligation placed further responsibilities upon the members of the Convention and the Committee of Revision.

The procedure of the Eighth Revision was closely followed in that of the Ninth Revision—the responsibilities of business management devolved on the Board of Trustees, and the Committee of Revision devoted its activities to the immediate duties of revision.

The membership of the Committee of Revision was increased to fifty-one, the President of the Convention being an ex-officio member. Fifteen sub-committees were named, of which the chairmen, elected by the members of the respective sub-committees, constituted an executive committee, whereby the work of revision was expedited.

The General Principles to guide the Committee of Revision, adopted

at the 1910 United States Pharmacopœial Convention, were very similar to those of the preceding Revision, except that lists of preparations were to be appended to Official Drugs and Chemicals, and alcoholic percentages to the preparations containing alcohol. Permission was also given to include additional serums and biological products if standardized by a Department of the Government.

The atomic weight basis was changed from hydrogen taken at 1 to oxygen taken at 16.

The metric system of weights and measures was retained, but the term "cubic centimeter" was replaced by "mil," a word formed from the first three letters of the term "milliliter." The term "mil" had been adopted by the British Pharmacopœia, and the U. S. Bureau of Standards pointed out that the cubic centimeter did not correspond exactly with a thousandth part of a liter.

The doses of the Ninth Revision were given in both the metric and apothecaries' systems, but these were not to be considered as equivalents, nor were the amounts to be regarded as obligatory on the physician.

Optional bio-assay methods were introduced for digitalis, squill, strophanthus, aconite, and suprarenal glands, and a biological method of assay was made a requirement for cannabis and its preparations, and for the solution of hypophysis.

Official methods were introduced for the determination of ash, of crude fiber, volatile and non-volatile extractive, melting points, boiling points, and congealing points, and also specifications for standard thermometers. Electrolytic determinations were included for mercury and zinc and their salts.

A chapter on Sterilization, as employed in the practice of medicine and pharmacy, was added, and another on Diagnostic Reagents and Clinical Tests.

In addition to other pharmacognostic descriptions, the microscopic characteristics of powdered drugs were given, and the purity rubric was extended to the organic drugs, giving the percentage of allowable admixtures of non-official parts of the drug plants and other foreign matter.

The principles of the International Protocol were adhered to in the Ninth Revision, but some changes were necessary and others desirable. Bitter almond water is used in this country largely as a vehicle and this makes the adoption of the requirement of 0.1 per cent of hydrocyanic acid inadvisable; a change in the strength of syrup of ipecac would not meet with favor by American physicians and pharmacists, nor would the stronger tincture of iodine of the Protocol be acceptable. The difference

in manufacturing methods in th. country and European countries presents further reasons for not fully complying with the International Protocol.

The publication of the abstracts of proposed changes with new standards and descriptions during the revision period met with general approval and attracted the attention of the members of revision committees and others in Europe. Through this medium the Committee secured aid in the work of revision, the value of the standard was enhanced and, thereby, advance information was given to those who make daily use of the Pharmacopœia.

Expressions of appreciation in resolutions, not only in the Pharmacopœial Convention but by other organizations interested in pharmacopœial revision, emphasized the value of the "Digest of Comments on the Pharmacopœia of the United States of America and on the National Formulary," which again served a most useful purpose as an aid in the revision and as a guide for the avoidance of unnecessary duplication of observation and of original work already recorded.

The Ninth Decennial Revision of the Pharmacopœia of the United States of America became official September 1, 1916. The Spanish edition, as of the preceding Revision, was received with growing satisfaction in the Spanish-speaking countries of the Americas. A Chinese translation was also published and met with favor in China and in this country by those who have business dealings in China.

The program of the Ninth Decennial Convention for the Revision of the Pharmacopœia evidenced that a number of revision workers had ceased their labors, and seldom has the toll of death been as great as during the period of revision and following the completion of the U. S. P. IX. The list included the distinguished names of Dr. Horatio C. Wood, President of the Convention; Dr. Otto A. Wall, who presided over its sessions; Charles Caspari, Jr., Second Vice-President; Leo Eliel, Fourth Vice-President; Joseph P. Remington, Chairman of the Committee of Revision; and C. Lewis Diehl, First Vice-Chairman.

Following the death of Chairman Remington in 1918, the First Vice-Chairman, C. Lewis Diehl, having died some time previously, the Second Vice-Chairman, Dr. Horatio C. Wood, Jr., called for an election for Chairman of the General Committee of Revision, and on April 6, 1918, Charles H. LaWall was elected to fill the vacancy for the remainder of the decade.

A number of other deaths having occurred during the decennial period, the vacancies were filled by an election held early in the summer

of 1918 when the following were added to the Committee of Revision: E. Fullerton Cook, W. B. Day, S. L. Hilton, H. P. Hynson, J. K. Lilly, Dr. L. G. Rowntree, L. A. Seltzer, and W. J. Teeters.

E. Fullerton Cook was elected Secretary to the General Committee to fill the place made vacant by the election of Secretary LaWall to the Chairmanship.

Vacancies having occurred in the Executive Committee by death and other causes, the following chairmen were elected during 1918 for the following Sub-committees: Inorganic Chemistry, H. V. Arny; Aromatic Waters, Spirits and Liquors, E. G. Eberle; Syrups and Elixirs, J. W. England; Nomenclature, Dr. H. H. Rusby. The remainder of the decade was devoted to the study of problems arising from the War and subsequent shortage of supplies and by preliminary investigations leading to the new revision to be undertaken in 1920.

TENTH REVISION

The U. S. Pharmacopœial Convention of 1920 met at Washington, D. C., on May 11, 1920, with the President, Harvey W. Wiley, presiding. The members of the Convention were composed of two of the incorporators, the officers of the Convention of 1910, the members of the Board of Trustees and of the Committee of Revision of 1910–1920, eleven governmental delegates representing the medical departments of the Army and the Navy, the United States Public Health Service, the United States Department of Agriculture and the U. S. Treasury, Customs Service; also twenty-two delegates from nine national associations and additional delegates from thirty-five States, making a total of two hundred and eighty-six registered delegates.

Following the election of the officers of the Convention, the Board of Trustees and the Revision Committee, various individuals and organizations submitted recommendations for the new revision.

At the close of the Convention the Board of Trustees and Committee of Revision met and organized for the work of the decade.

The general policies and methods of procedure for the Tenth Revision were similar to those of the Eighth and Ninth Revisions. Most of the work of revision was conducted by correspondence but three meetings of the General Committee, including Sub-committee conferences, were held. These made possible the prompt settlement of many questions and shortened the time needed to complete the revision.

The General Committee was divided into fifteen Sub-committees, the Chairmen of these Sub-committees being elected to membership

on an Executive Committee. The policy of the revision was to place in the Circulars of the main Committee the discussion on all general questions as well as Sub-committee reports and comments, but to refer to the Sub-committees for decisions upon all questions of detail involving special technical knowledge.

In the first conference of the General Committee, immediately following the Convention, the Sub-committee on Scope was organized. Its membership was made up of sixteen physicians and five pharmacists. They were given the responsibility of proposing the admission to the U. S. P. X of therapeutically active substances and those which were pharmaceutical necessities. A "Referee Committee on Scope," consisting of the twenty-one physicians on the General Committee, was given the final responsibility for deciding disputed questions involving the admission of substances of therapeutic value.

A new feature of the decade was the election of auxiliary members to Sub-committees for the purpose of securing the help of many experts in the work of revision. These auxiliary members received the official Sub-committee Bulletins and were invited to discuss in the Bulletins all questions before the Sub-committee with which they were associated. These members, however, did not vote or attend conferences.

The former division of the Pharmacopœia into "Part I" and "Part II" was abandoned, each section being designated by an appropriate title. This placed all sections of the book upon the same status and avoided any question of the legality of special parts.

The standards of the Pharmacopœia were again made to agree as closely as was practicable with the International Standards adopted by the Brussels Conference of 1902.

The Revision Committee endeavored to conform to the recommendations of the 1920 Convention as set forth in the "General Principles" which had been adopted by the Convention. These were printed in full in the Pharmacopœia and covered such points as the scope limitations and scope policies, the adoption of an "average dose," guides for nomenclature, the basis for the purity and strength policy, the retention of the metric system of weights and measures and the standard temperature of 25° C., the publicity policy, the authorization for supplements and other general guides for the revision.

Following the publication of the U. S. P. X two deaths occurred in the Committee of Revision and these vacancies were filled by the election of J. Leon Lascoff, of New York, N. Y., and John Phillips, M.D., of Cleveland, Ohio.

During the closing years of the decade the Executive Committee planned and directed a number of scientific researches on unsolved questions associated with the revision and placed these on record as an aid to the next Committee of Revision.

The Trustees proposed the establishment of "The Remington Research Fund," and this recommendation was approved by the U. S. P. Convention of 1930.

The Tenth Revision of the Pharmacopœia of the United States became official on January 1, 1926. The Spanish edition of the Pharmacopœia was translated by a Committee of the University of Havana and was again made official in Cuba and has been widely distributed through the Republics of Central and South America.

During the active period of revision a special conference on vitamins was called (1924) and this pioneer group developed the first official vitamin A assay. That there was an anti-rachitic factor was then known, but it had not yet been named vitamin D. With the subsequent extensive and rapid development in the knowledge of vitamins it became necessary to revise these vitamin standards and assay methods, and a modified cod liver oil monograph with new assays was issued in 1934 in accordance with the new U. S. P. policy of "Interim Revision Announcements." Scientific development in other fields made additional revisions desirable and four of these "Announcements" or supplements were issued.

ELEVENTH REVISION

The Convention for the Eleventh Revision of the United States Pharmacopœia was called to order at Washington, D. C., on May 13, 1930, by the President, Dr. Reid Hunt.

The membership of the Convention included one of the incorporators, the officers of the Convention of 1920, the members of the Board of Trustees and the members of the Committee of Revision of 1920–1930, and governmental delegates, representing the Medical Departments of the Army and Navy, the United States Public Health Service, the United States Department of Agriculture, and the United States Department of Commerce. There were also delegates from ten national associations and additional delegates from medical and pharmaceutical associations and colleges representing forty-five States and Territories, Cuba, and the Philippines, making a total of over four hundred registered delegates.

Amendments to the Constitution and By-Laws of the Convention as recommended by the Board of Trustees, were approved.

Following a discussion on the responsibility of Sub-committees, especially with reference to the decisions on scope, the following resolution was approved by the Convention:

"*Resolved,* That all reports of all Sub-committees of the Committee of Revision shall be printed in bulletin form and shall be submitted to each member of the Committee of Revision. If no objection is raised the report of the Sub-committee will obtain. If objections are raised, the report shall be submitted to a vote of the entire Committee of Revision and the report can be rejected only when a vote of at least two-thirds of the entire Committee of Revision is registered against the report."

Officers of the Convention, members of the Board of Trustees, and members of the Committee of Revision were duly elected. Among these were persons who came from twenty-seven States, representing thirty-two colleges or universities. In addition to the regular members of the Revision Committee and Board of Trustees there were more than two hundred physicians, pharmacists, and experts in related sciences who assisted in the revision work during the decade. This comprehensive group thus provided nation-wide co-operation in Pharmacopœial work.

The Convention considered and adopted "General Principles" to serve as a guide for the Revision Committee, these "General Principles" not varying materially from those of the preceding decade.

Various organizations presented communications dealing with revision policies, suggesting changes in the Pharmacopœia and proposing additions and deletions, all of which were referred to the Committee of Revision or Board of Trustees for appropriate action.

The organization of the Committee of Revision and of the Board of Trustees immediately followed the close of the Convention.

The question of scope, so far as it involved therapeutically active substances, was again left largely to the physician members of the Committee, while those substances required for the making of preparations and therefore "pharmaceutic necessities," were admitted automatically when recommended by the pharmaceutical members.

The Sub-committee on Scope, composed of eighteen physicians and five pharmacists, continuously kept before it the traditional policy of the Pharmacopœia, namely, to select for admission those substances and their preparations which the physicians believed to be of outstanding importance in modern medical practice.

After organization, the General Committee and the fifteen Subcommittees held two general conferences and the smaller groups had frequent meetings. The major work of revision, as before, was conducted by means of official Circulars and Bulletins carrying reports, discussions, and votes, and by an extensive personal correspondence. Because of the necessity of dealing with certain highly technical problems, four Advisory Boards composed of individuals especially qualified in the subjects covered were created. These Boards dealt with the control and standardization of vitamins, anti-anemia products, hormones, and sterile and other surgical products. The recommendations of these Boards were approved by the General Committee of Revision before they became a part of the official text.

The new Pharmacopœia became official on June 1, 1936, but the rapidity of scientific and medical advances was such that it was found desirable to issue two Supplements, which became official on December 1, 1937, and January 1, 1940, respectively. By this means the Pharmacopœia endeavored to maintain its scope and standards in harmony with current developments in medicine, pharmacy, and the related sciences.

The revised Federal Food, Drug and Cosmetic Act, passed in 1938, again recognized the United States Pharmacopœia as an official compendium, and the new provisions of this act greatly increased the responsibilities of the Revision Committee. To meet these new demands upon the Pharmacopœia, it was proposed that two revisions of the Pharmacopœia be published during the next decade, and also Interim Revision Announcements or Supplements covering new items or revised standards, whenever, in the opinion of the Committee of Revision and the Board of Trustees, these are believed to be necessary. This program is made possible by the adoption of the plan of "continuous revision."

During the decade the Committee of Revision sponsored two series, of twenty-four articles each, for the purpose of extending Pharmacopœial information to physicians and pharmacists. These articles originally appeared in the Journal of the American Medical Association and the Spanish translations in the Bulletins of the Pan American Sanitary Bureau and were thus widely distributed through Central and South America. The first Series was also published in book form in both English and Spanish and was widely distributed.

The Board of Trustees again published a Spanish edition of the new Pharmacopœia. They had the good fortune to receive aid from the Pan

American Sanitary Bureau in Washington both in preparing the translation and in bringing the Spanish edition to the attention of all Central and South American countries.

A new feature of the revision period was the preparation and distribution of reference standards to be used for comparison in official assays. Such standards were provided for Vitamin A, Vitamin D, Vitamin B_1 (Thiamine Hydrochloride), Vitamin C (Ascorbic Acid), Ergot, Digitalis, Epinephrine, Ouabain, Pepsin, Posterior Pituitary, Estrone, Aconite, and Trypsin. In addition, the Pharmacopœia assumed the responsibility of distributing International standards for biological products for the League of Nations.

TWELFTH REVISION

The 1940 Pharmacopœial Convention was called to order by the President, Dr. Walter A. Bastedo, at the Willard Hotel, Washington, D. C., on May 14. There were 487 delegates present from 247 organizations or institutions. Among these were Government representatives from the Army, the Navy, the Public Health Service, the Food and Drug Administration, and the Bureau of Standards. Other delegates came from ten national associations in the fields of medicine, pharmacy, chemistry, and dentistry, and from medical and pharmaceutical organizations and colleges scattered through forty-seven States and Territories, including Hawaii, the Philippines, and Puerto Rico. Cuba sent five delegates. This broad representation reflects the wide interest in the Pharmacopœia and indicates its truly national character.

Guests were also present from other Central and South American countries and the Constitution was subsequently revised to give full delegate standing in the future to the American Nations which have adopted the United States Pharmacopœia. The following neighboring countries, at this time, have given official standing to the U. S. P.: Costa Rica, Cuba, Dominican Republic, Nicaragua, Panama, and Uruguay.

Comprehensive and illuminating reports were presented by the President and the Secretary of the Pharmacopœial Convention, also by the Chairman and Secretary of the Board of Trustees, and the Chairman of the Committee of Revision. These reports are printed in full in the Abstract of Proceedings and indicate the development and greatly increased responsibility of the Pharmacopœia as a standard for medicinal substances and preparations used in modern medicine, standards which are actively enforced by the Government under the authority of Federal, State, and Municipal Food, Drug, and Cosmetic laws.

Three very important addresses were heard at the Convention which were indicative of the effective and satisfactory relationship existing between the Pharmacopœia, the medical and pharmaceutical professions, and the Food and Drug Administration. The latter Government department is responsible for the Federal enforcement of Pharmacopœial standards and its close co-operation and assistance, together with that of the National Institute of Health have been especially gratifying elements in revision work.

At the Convention a number of necessary alterations were made in the Constitution and By-Laws to meet changing conditions, but it was recognized that there should be a thorough study of the existing organization, which is essentially the same as when the Convention was incorporated in 1900. By authority of the Convention, the President was directed to appoint a Committee on Constitution and By-Laws, to report at an adjourned meeting of the Convention to be called by the Board of Trustees.

Reports at the Convention indicated a gratifying financial condition with the sale to February 29, 1940, of 52,271 copies of the English Edition of the U. S. P. XI and 1095 copies of the Spanish Edition. Assets, as of April 15, 1940, were announced as having a value of $115,-176.35.

The preparation and distribution of Reference Standards for a number of important drugs assayed biologically was featured in Convention reports. These substances are used by manufacturers in standardizing their products before release and by Government officials in their control program. Over 10,000 packages of U. S. P. Reference Standards were distributed during the period between 1930 and 1940. The number of products requiring Reference Standards in the U. S. P. XII has notably increased and now includes some chemical assays. The number of Standards now distributed has more than doubled. U. S. P. Reference Standards are also being requested by other countries, and have been sent during the twelve months previous to May, 1946, to Argentina, Brazil, Canada, Chile, China, Colombia, Cuba, Denmark, England, Iceland, Mexico, Norway, Palestine, Russia, Spain, Syria, and Venezuela.

It will be of interest to record that the Board of Trustees appropriated about $36,000 for research on revision problems between 1930 and 1940 and that a very conservative estimate of the value of voluntary assistance on pharmacopœial projects during the decade, exclusive of the cost of participation by Government laboratories, represented an expenditure of well over $500,000.

The Convention also authorized the Board of Trustees to establish independent Pharmacopœia headquarters and a building was purchased and temporary offices established in Philadelphia in 1945. This is preliminary to the setting up of permanent headquarters when a suitable site has been selected.

A number of scientific conferences, dealing with pharmacopœial revision problems, were arranged as a pre-convention feature and were attended by most of the delegates. These conferences were organized and presided over by the U. S. P. Subcommittee Chairmen. The papers presented and the discussions thereon were referred to the incoming Subcommittees for consideration during the Twelfth Revision.

Other suggestions received during the Convention from delegates and from member organizations were also referred to the appropriate officials, committees, or boards.

The Convention also considered and adopted General Principles for the work of revision and recommended them for the consideration of the Committee of Revision, see page lxxvi. The Convention also elected new officers and members of the Board of Trustees and of the Committee of Revision and, immediately following adjournment, the latter bodies met and organized for the handling of pharmacopœial affairs between Convention meetings.

The committee appointed to consider and offer suggestions for the revision of the Constitution and By-Laws began its work promptly and on April 7, 1942, an adjourned meeting of the Convention was held at Cleveland, Ohio, to receive and act upon the Committee's report. At this adjourned meeting officers of the Army and of the Food and Drug Administration were represented, also ten national organizations, numerous medical and pharmaceutical associations, and institutions from thirty States and Territories.

The Committee submitted a revised Constitution and By-Laws, but the Chairman of the Board of Trustees announced that, after consulting counsel, it was found that the By-Laws only could be changed at this time, since the existing Constitution permits constitutional changes to be made at the decennial meeting, after three months' advance announcement, or upon presentation at the first session, when they may be acted upon at the next succeeding session.

The revised By-Laws, which embodied many forward-looking and advantageous provisions to meet modern conditions, were discussed and adopted essentially as proposed. They are printed in full on pages xlvii to lix. Certain features do not go into effect until 1950. An impor-

tant amendment of the By-Laws adopted at this time authorized the Board of Trustees to issue revisions of the Pharmacopœia at approximately five-year intervals and such Supplements to the Pharmacopœia as may be deemed necessary to maintain it as an effective standard.

It was also agreed that the proposed revisions in the Constitution will be further reviewed and presented for consideration at the U. S. P. Convention of 1950. These proposed revisions are printed in the Proceedings of the 1942 Adjourned Meeting.

Much work had been done on the Twelfth Revision prior to the 1940 Convention and immediately following the reorganization of the new Revision Committee the program was intensified and the new book published during the summer of 1942, and became official on November 1, 1942. It carried more than one hundred new additions.

With World War II being prosecuted intensively during this period, pharmacopœial standards were subject to many modifications to meet war conditions and intensive medical and pharmaceutical developments. The issuance of numerous Sheet Supplements and a Bound Supplement of over 100 pages are tangible evidence of the need at this time for a continuous revision.

An Edition of the U. S. P. XII in Spanish was published in 1944 with the full co-operation of the Pan American Sanitary Bureau in both translation and publication. The Board of Trustees, however, again financed the project, as it has always done since the first Spanish Edition was issued in 1907, the U. S. P. VIII.

The availability of established titles and standards in the Spanish language was of especial value during the war, when the distribution of medicines from the United States through Central and South American countries became a greatly increased activity.

ARTICLES OF INCORPORATION

IN accordance with the instructions of the United States Pharmacopœial Convention of May, 1900, the Board of Trustees directed its Chairman, Mr. W. S. Thompson, of Washington, D. C., to employ an attorney who should take out articles of incorporation for the Convention under the laws of the District of Columbia.

The first difficulty encountered was in the fact that the laws aforesaid require that a majority of the Incorporators be residents of the District of Columbia. This made it, at least, impracticable to include among these Incorporators the Officers and Committee of Revision elected by the Convention. It was then determined to ask the Committee on Credentials and Arrangements to officiate in this capacity, and the Treasurer, Dr. W. M. Mew, took the place of Dr. J. E. Brackett, because of the latter's absence from the country.

These preliminaries having been arranged, the following certificate of incorporation was drawn up, signed, and recorded, finally, on the eleventh day of July, 1900:

CERTIFICATE OF INCORPORATION

This is to certify that we, whose names are hereunto subscribed, citizens of the United States, of full age, and a majority citizens of the District of Columbia, do associate ourselves together pursuant to the provisions of sections 545–552 inclusive of the Revised Statutes of the United States relating to the District of Columbia and of the Act of Congress to amend the same, approved the twenty-third day of April, 1884, under the corporate name of The United States Pharmacopœial Convention.

This Association is organized for a period of nine hundred and ninety-nine years.

The particular objects and business of this Association are the encouragement and promotion of the science and art of medicine and pharmacy by selecting by research and experiment and other proper methods and by naming such materials as may be properly used as medicines and drugs with formulas for their preparation; by establishing one uniform standard and guide for the use of those engaged in the practice of medicine and pharmacy in the United States whereby the identity, strength, and purity of all such medicines and drugs may be accurately determined, and for other like and similar purposes; and by printing and distributing at suitable intervals such formulas and the results of such and similar selections, names and determinations among the members of this Association, pharmacists, and physicians generally in the United States and others interested in pharmacy and medicine.

The management and control of the affairs, funds, and property of this Association for the first year of its existence shall be vested in a Board of Trustees consisting of the seven following persons:*

Albert E. Ebert.
Samuel A. D. Sheppard.
William S. Thompson.
Charles E. Dohme.
George W. Sloan.
Horatio C. Wood.
Charles Rice.

In testimony whereof we have hereunto set our hands and affixed our seals this seventh day of July, 1900.

William S. Thompson. [SEAL]
G. Lloyd Magruder. [SEAL]
John T. Winter. [SEAL]
Thomas C. Smith. [SEAL]
Murray G. Motter. [SEAL]
William M. Mew. [SEAL]
Frank M. Criswell. [SEAL]

* The laws of the District of Columbia with regard to corporations require that the Board of Trustees, or Directors, for the first year shall be named in the Certificate of Incorporation.

CONSTITUTION
OF THE
UNITED STATES PHARMACOPŒIAL CONVENTION

AS REVISED BY THE CONVENTION AT ITS DECENNIAL MEETING, MAY, 1940

CONSTITUTION

ARTICLE I

NAME AND OBJECTS

SECTION 1. The corporate name of this organization shall be "The United States Pharmacopœial Convention."

SECTION 2. Its objects shall be those declared in its Certificate of Incorporation, and shall include the revision and publication of the Pharmacopœia of the United States of America.

ARTICLE II

MEMBERSHIP

SECTION 1. Members of the United States Pharmacopœial Convention shall consist of delegates representing the following institutions and organizations and the herein designated representatives [Divisions] of the Federal government:

Incorporated Medical Colleges, and Medical Schools connected with Incorporated Colleges and Universities; Incorporated Colleges of Pharmacy, and Pharmaceutical Schools connected with Incorporated Universities; Incorporated State Medical Associations; Incorporated State Pharmaceutical Associations, and the organizations not herein named which were admitted to representation in the Convention of 1900, provided, however, that no such institution or organization shall be entitled to representation in the Convention unless it shall have been incorporated within the United States, and shall have been in continuous operation for at least five years preceding the date fixed for the decennial meeting of the Convention.

Also the American Medical Association; the American Pharmaceutical Association; the American Chemical Society; the National Association of Retail Druggists; the National Association of Boards of Pharmacy;

the Federation of State Medical Boards of the United States; the Association of Official Agricultural Chemists; the Association of Dairy, Food and Drug Officials of the United States; the National Wholesale Druggists' Association; the American Dental Association; the American Drug Manufacturers' Association; the American Pharmaceutical Manufacturers' Association; the Mellon Institute of Industrial Research of the University of Pittsburgh; the School of Hygiene and Public Health of Johns Hopkins University; the American College of Physicians; the American College of Surgeons; the American Hospital Association; the Rockefeller Institute for Medical Research;, the American Veterinary Medical Association; also delegates appointed by the Surgeon General of the United States Army, the Surgeon General of the United States Navy, the Surgeon General of the United States Public Health Service, the Secretary of Commerce, and the Federal Commissioner of Foods and Drugs.

Also such Medical and Pharmaceutical Associations, and such Colleges of Medicine and Pharmacy in Alaska, Hawaii, Puerto Rico, and the Philippines, and in the American Nations which have adopted the Pharmacopœia of the United States, as have been approved by the Board of Trustees.

SECTION 2. Each institution, organization, and Governmental Division designated in the preceding Section shall be entitled to send not exceeding three delegates to the decennial meeting of the Convention. In order to insure equality of voting power for all organizations, institutions, and Governmental Divisions represented at the meeting, each delegation shall be entitled to one vote upon all questions. In case of difference of opinion among the members of any delegation, each member of such delegation shall be entitled to a proportionate share of one vote.

Delegates shall be elected or appointed in such manner as their several institutions or organizations shall provide, but no delegates shall be accepted as members of the Convention unless their credentials shall comply with the provisions of the By-Laws, and shall have been examined and approved as provided therein.

Delegates admitted as members at any decennial meeting shall continue to be members of the United States Pharmacopœial Convention until the organization of the next ensuing decennial meeting of the Convention.

SECTION 3. No delegate shall represent more than one institution, either in whole or in part.

Article III

OFFICERS

The officers of the United States Pharmacopœial Convention shall be a President, five Vice-Presidents, a Secretary and an Assistant Secretary, and a Treasurer, to be elected by ballot at each decennial meeting. The Board of Trustees (or Directors) named in the certificate of incorporation, or their successors, shall elect these officers to serve until the first regular decennial meeting and until their successors shall have been elected and qualified.

Article IV

COMMITTEES AND TRUSTEES

The members of the United States Pharmacopœial Convention shall also at each decennial meeting elect a General Committee of Revision and a Board of Trustees. Until the first decennial meeting, the Board of Trustees shall be the persons named as such Board in the certificate of incorporation, who shall serve as such Trustees until their successors shall have been elected and qualified. The By-Laws shall provide for the method of election and shall prescribe the duties of said Committees and Board of Trustees. The Board of Trustees named in said certificate, or their successors, shall also appoint all other committees that may be required for the operation of the corporation until its first decennial meeting.

Article V

MEETINGS

The regular meetings of this corporation shall be held once in ten years. The time of holding the decennial meeting shall be upon the second Tuesday in May, in the first year in each decade ending in zero, and the place of meeting shall be in the city of Washington, D. C., unless, in case of emergency, the Board of Trustees and officers of the Convention, by joint vote, shall select some other place of meeting and some date within the same year other than the second Tuesday in May. The first decennial meeting shall be held in the year 1910.

The President shall call a special meeting upon the written request of not less than fifty delegations entitled to membership in the corporation, at least twenty-five of which delegations shall represent medical organizations or colleges, and at least twenty-five of which delegations shall represent pharmaceutical organizations or colleges.

ARTICLE VI

AMENDMENTS

Every proposition to alter or amend this Constitution shall be submitted in writing to the Board of Trustees, and having received the votes of at least five members of the Board of Trustees, shall be submitted to the medical and pharmaceutical press, at least three months before the decennial meeting of the United States Pharmacopœial Convention, when, upon receiving the votes of at least three-fourths of the members present and voting, it shall become a part of this Constitution.

Additional amendments may be presented in writing at the first session of the decennial meeting of the Convention, and shall be referred to the Board of Trustees. The Board of Trustees shall report upon such proposed amendments at the next succeeding session, when they may be acted upon as in other cases.

BY-LAWS
OF THE
UNITED STATES PHARMACOPŒIAL CONVENTION

AS REVISED BY THE CONVENTION AT ITS ADJOURNED MEETING, APRIL, 1942

BY-LAWS

CHAPTER I

THE PRESIDENT

ARTICLE I. The President shall preside at all meetings of the United States Pharmacopœial Convention until his successor shall have been elected and installed. In the event of his absence or inability to preside, one of the Vice-Presidents, or in the absence of all, a President *pro tempore*, to be appointed by the Board of Trustees, shall conduct the meeting.

ARTICLE II. A vacancy occurring in the Presidency between meetings of the Pharmacopœial Convention shall be filled by one of the Vice-Presidents, or in event of their inability to serve, the Board of Trustees shall appoint a member of the Pharmacopœial Convention as President.

ARTICLE III. In the absence of the Secretary, the President shall appoint a Secretary *pro tempore*.

ARTICLE IV. The President shall have a right to call a member to the chair in order that he may take the floor in debate. The President shall not vote except in the case of a tie, when he shall cast the deciding ballot.

ARTICLE V. The President shall appoint all committees not otherwise provided for in the By-Laws.

ARTICLE VI. On or about the first of January of the year immediately preceding that of the decennial meeting of the Pharmacopœial Convention, the President, through the Secretary, shall issue to those entitled under the Constitution to representation, an announcement of the meeting, and a request to appoint a delegate and an alternate. He shall repeat the announcement and the request eight months later and shall also request medical and pharmaceutical journals of the United States to publish the announcement for the said meeting.

ARTICLE VII. The President shall present an address at the decennial meeting.

ARTICLE VIII. The President *ex-officio* shall be a member of the Board of Trustees, and of all committees.

CHAPTER II

THE VICE-PRESIDENTS

ARTICLE I. One of the Vice-Presidents shall fill a vacancy in the Presidency and shall preside in the absence of the President. He shall be governed by the rules set forth in the By-Laws.

ARTICLE II. A vacancy occurring in the office of Vice-President between meetings of the Pharmacopœial Convention shall be filled by the Board of Trustees.

CHAPTER III

THE SECRETARY AND ASSISTANT SECRETARY

ARTICLE I. The Secretary shall keep the minutes of each meeting of the Pharmacopœial Convention and receive all reports, essays and papers presented to the said meeting. He shall compile abstracts of the decennial and special meetings of the Pharmacopœial Convention and submit them to the Board of Trustees and, upon its order, shall arrange for their publication.

ARTICLE II. The Secretary shall present to the meeting of the Pharmacopœial Convention all papers handed to him for that purpose by the President, and shall record the ayes and nays when required; he

shall notify the chairman and members of each committee of their appointment, giving each member the name of the chairman of his committee and the names of the members, and state the business upon which the committee is to act.

ARTICLE III. The Secretary shall deliver all documents of the Pharmacopœial Convention to the Board of Trustees and, upon order, deposit them in the Archives of the Pharmacopœial Convention. The Archives shall be in the custody of the Board of Trustees.

ARTICLE IV. The Secretary shall issue such announcements and requests as are provided for in Chapter I, Article VI, of the By-Laws, together with credential forms.

ARTICLE V. The Secretary shall act as Secretary of the meetings of the Pharmacopœial Convention until his successor shall have been elected and installed.

ARTICLE VI. The Secretary *ex-officio* shall be a member of the Committee on Credentials and of the Committee on Arrangements and shall serve as Secretary of the Nominating Committee.

ARTICLE VII. A vacancy occurring in the office of the Secretary between meetings of the Pharmacopœial Convention shall be filled by the Board of Trustees.

ARTICLE VIII. It shall be the duty of the Assistant Secretary to aid the Secretary in his official duties.

CHAPTER IV

THE TREASURER

ARTICLE I. The Treasurer shall receive all moneys coming from any source to the Pharmacopœial Convention and shall pay out moneys as may be directed by the Board of Trustees.

ARTICLE II. The Treasurer shall not pay moneys except on the authorization of the Board of Trustees. All bills must be accompanied by proper vouchers, and all payments shall be by checks, having the signatures of the Treasurer and one of two authorized officials under such arrangements as the Board of Trustees may specify. The Treasurer and each of such duly authorized officials shall procure and file a bond to the amount of $10,000, the bond to be signed and executed by a bonding or surety company acceptable to the Board of Trustees. The expense attending the procurement of the bonds shall be paid from the funds of the Pharmacopœial Convention.

ARTICLE III. The Treasurer shall present at the decennial meeting of the Pharmacopœial Convention a complete financial statement including the receipts and disbursements during his term of office, and he shall present annually to the Board of Trustees a complete financial statement. The annual and decennial reports of the Treasurer must be audited by a certified public accountant. The Treasurer shall act as Treasurer until his successor shall have been elected and installed.

ARTICLE IV. The Treasurer *ex-officio* shall be a member of the Board of Trustees without vote.

ARTICLE V. A vacancy occurring in the office of Treasurer between meetings of the Pharmacopœial Convention shall be filled by the Board of Trustees.

CHAPTER V

THE BOARD OF TRUSTEES

ARTICLE I. *Section 1.* The Board of Trustees shall consist of nine persons including the President of the Pharmacopœial Convention *ex-officio.* Six shall be elected from the accredited delegates at the decennial meeting. The Treasurer and Director of Pharmacopœial Revision shall be *ex-officio* members of the Board of Trustees but shall not be entitled to vote. Of the six elected members of the Board of Trustees, at least two shall be delegates from pharmaceutical colleges or organizations and at least two shall be delegates from medical colleges or organizations. They shall be nominated from the floor and elected by the accredited delegates at each decennial meeting of the Pharmacopœial Convention. With the exception of the President of the Pharmacopœial Convention the voting members of the Board of Trustees shall not be members of the General Committee of Revision.

Section 2. The Board of Trustees shall fill vacancies for unexpired terms of office of the six elected members of the Board of Trustees, the President, the Secretary, and the Treasurer, as hereinbefore provided.

ARTICLE II. The officers of the Board of Trustees shall consist of a Chairman and a Secretary, both of whom shall be elected by ballot by the Board. A majority of the votes of the Board shall be sufficient to elect. The Chairman of the Board of Trustees shall serve as an *ex-officio* member of the Committee on Credentials and of the Committee on Arrangements. The Secretary of the Board of Trustees need not be a member of the Board of Trustees.

ARTICLE III. The Board of Trustees shall issue a revision of the

United States Pharmacopœia at approximately five-year intervals and unless unusual circumstances prevent shall also issue such Supplements to the United States Pharmacopœia as may be deemed necessary.

ARTICLE IV. *Section 1.* The Board of Trustees shall have the management and control of the affairs and funds of the Pharmacopœial Convention, except as in herein otherwise provided.

Each year the Board of Trustees shall publish an annual report of the Treasurer, which shall include, under appropriate headings, expenditures made for administration of the Pharmacopœial Convention and for the work of revision of The United States Pharmacopœia.

Following the publication of each Pharmacopœia the Treasurer shall present to the Board of Trustees for publication a complete statement of the honoraria paid for revision and administrative work together with the names of those to whom the moneys were paid.

The Board of Trustees shall invest the funds of the Pharmacopœial Convention, execute any and all legal contracts or agreements authorized by the Pharmacopœial Convention or the Board of Trustees, pay all moneys due for services performed, transact business involving financial or other matters that may be for the best interests of the Pharmacopœial Convention, and perform such other duties as the Pharmacopœial Convention may direct.

Upon request of the Executive Committee of Revision, the Board of Trustees may ask the resignation of a member of the General Committee of Revision.

The Board of Trustees, after consultation with the Committee of Revision, shall designate a date, reasonably distant from the announced date of publication, when a new United States Pharmacopœia or Supplement is to become official.

Section 2. Before the decennial meeting of the Pharmacopœial Convention, or at any time in case of a vacancy, the Board of Trustees, after receiving the advice and suggestions of the Nominating Committee, shall elect a Director of Pharmacopœial Revision, preferably one who has served as a member of a Committee of Revision. Upon recommendation of the Director of Pharmacopœial Revision, the Board of Trustees may appoint an assistant to the Director. The assistant shall perform such duties as may be assigned to him by the Director or by the Board of Trustees, and he may serve as Secretary to the Board of Trustees if deemed desirable by the Board.

Section 3. The Board of Trustees shall maintain a headquarters for the business of The United States Pharmacopœia.

ARTICLE V. There shall be an annual meeting of the Board of Trustees at such time and place as the Board shall direct. The Board of Trustees shall have the right to transact business by correspondence. A motion by mail shall require no seconder. Special meetings of the Board of Trustees shall be called upon the written request of at least four voting members. The Chairman shall have the power to call a special meeting whenever he shall deem it necessary. Four voting members shall constitute a quorum. An elected member of the Board shall not receive compensation for his services unless elected to serve as Secretary of the Board. Members of the Board of Trustees shall be reimbursed from the funds of the Pharmacopœial Convention for traveling and other necessary expenses which may be incurred by them in the performance of their duties.

CHAPTER VI

THE GENERAL AND EXECUTIVE COMMITTEES OF REVISION

ARTICLE I. The General Committee of Revision shall have a membership of sixty persons, of whom twenty shall be qualified in medical sciences and forty in pharmaceutical and allied sciences, together with the President of the Pharmacopœial Convention, *ex-officio*, and the Director of Pharmacopœial Revision, *ex-officio*. The members of the General Committee of Revision shall be elected at the decennial meeting by the accredited delegates of the Pharmacopœial Convention. The business of the Committee may be transacted by correspondence.

ARTICLE II. As promptly as possible after their election, the members of the General Committee of Revision shall assemble, at the call of the Director of Pharmacopœial Revision, for organization and the transaction of such other business as may be necessary to promote the work of revision.

ARTICLE III. The General Committee of Revision shall organize by electing, from among its members, a Secretary, who shall also serve as the Secretary of the Executive Committee of Revision. The Director of Pharmacopœial Revision shall organize from the General Committee of Revision ten subcommittees, each covering a specific division of the work of revision. The membership of subcommittees shall be approved by the General Committee of Revision and by the Board of Trustees.

Each subcommittee shall elect its own chairman. The ten subcommittee chairmen, so elected, together with the Director of Pharmaco-

pœial Revision, *ex-officio*, shall constitute the Executive Committee of Revision. The Director of Pharmacopœial Revision shall be Chairman of the General Committee of Revision and of the Executive Committee of Revision.

ARTICLE IV. The General Committee of Revision and the Executive Committee of Revision shall make such rules and regulations, not in conflict with the Constitution and By-Laws, as may be necessary to the proper discharge of their respective functions.

ARTICLE V. The General Committee of Revision shall decide on all questions referred to it by the Director of Pharmacopœial Revision or by the Executive Committee of Revision. Before a new United States Pharmacopœia or a new Supplement is released, it shall be approved by the General Committee of Revision and by the Board of Trustees.

ARTICLE VI. Vacancies in the General Committee of Revision shall be filled by the Director of Pharmacopœial Revision with the advice and consent of the General Committee of Revision and of the Board of Trustees.

ARTICLE VII. If a member of the General Committee of Revision persistently neglects to perform the duties which he has assumed, the Executive Committee of Revision may recommend to the Board of Trustees that his resignation be requested.

ARTICLE VIII. The Executive Committee of Revision shall execute such orders or resolutions as have been assigned to it by the Pharmacopœial Convention, the General Committee of Revision, or the Board of Trustees. The Executive Committee shall assist in preparation of manuscript and reading of proof for The United States Pharmacopœia. It shall promote pharmacopœial research and assist in making preparation for the ensuing revision. The business of the Executive Committee of Revision may be conducted by correspondence.

ARTICLE IX. At least one year before the decennial meeting of the Pharmacopœial Convention, the Executive Committee of Revision shall prepare and publish an outline of specific classifications of service deemed necessary to the efficient prosecution of the work of the next revision of The United States Pharmacopœia. This outline shall serve as a guide to those submitting names of persons to be considered for membership on the General Committee of Revision, to be elected at the forthcoming Pharmacopœial Convention.

ARTICLE X. Vacancies occurring in the Executive Committee of Revision shall be filled by vote of the members of the subcommittee in which the vacancy has occurred.

CHAPTER VII

THE DIRECTOR OF PHARMACOPŒIAL REVISION

ARTICLE I. The Director of Pharmacopœial Revision shall be elected by the Board of Trustees as provided by the By-Laws. He shall hold office until his successor shall have been elected by the Board of Trustees. In case of a vacancy in the position of Director of Pharmacopœial Revision, the Secretary of the General Committee of Revision shall act as Director until such time as a new Director shall have been elected by the Board of Trustees.

ARTICLE II. The Director of Pharmacopœial Revision shall act as Chairman of the General Committee of Revision and of the Executive Committee of Revision. The Director of Pharmacopœial Revision shall have charge of the work of revision, and shall prepare the final manuscript of The United States Pharmacopœia.

ARTICLE III. As promptly as possible after the election of the members of the General Committee of Revision, the Director of Pharmacopœial Revision shall call the members of the General Committee together for the purpose of organization and transaction of such other business as may be necessary to promote the work of revision.

ARTICLE IV. The Director of Pharmacopœial Revision shall appoint all subcommittees, research and other committees and scientific collaborators, with the advice and consent of the General Committee of Revision and of the Board of Trustees. He shall present an annual report to the Board of Trustees and shall also present a decennial report of the General Committee of Revision at the decennial meeting of the Pharmacopœial Convention.

ARTICLE V. The Director of Pharmacopœial Revision, with the advice and consent of the General Committee of Revision and of the Board of Trustees, shall fill any vacancy in the General Committee of Revision by appointment.

ARTICLE VI. The salary of the Director of Pharmacopœial Revision shall be determined by the Board of Trustees.

CHAPTER VIII

THE NOMINATING COMMITTEE

ARTICLE I. The Nominating Committee shall consist of the chairmen of the subcommittees together with two medical members and two pharmaceutical members of the Pharmacopœial Convention, to be selected by the Board of Trustees, and who are not (1) members of the

General or of the Executive Committee of Revision or of the Board of Trustees, (2) salaried employees or (3) officers of the Pharmacopœial Convention. The Nominating Committee shall be organized at least one year prior to the meeting of the decennial Pharmacopœial Convention and shall elect its own Chairman. The Secretary of the Convention shall serve as Secretary of the Nominating Committee.

ARTICLE II. At least nine months prior to the decennial meeting of the Pharmacopœial Convention, the Secretary of the Nominating Committee shall issue to all institutions, organizations, and divisions of the Federal Government, entitled to representation in the Pharmacopœial Convention, and to members of the General Committee of Revision, a request to submit to the Secretary of the Pharmacopœial Convention the names of persons whose qualifications entitle them to consideration as nominees for membership on the General Committee of Revision. Each name submitted shall be accompanied by a statement on a form supplied by the Nominating Committee indicating affiliations, academic and professional backgrounds, and specific qualifications for membership on the General Committee of Revision. These recommendations shall be given primary consideration by the Nominating Committee in selecting nominees for membership on the General Committee of Revision.

All recommendations received by the Secretary shall be submitted to the Nominating Committee not later than January 1 of the Convention year.

ARTICLE III. At the decennial meeting of the Pharmacopœial Convention, the Nominating Committee shall submit to each delegate or alternate at the time when he presents his credentials to the Credentials Committee, a list of names of forty persons qualified in the medical sciences and eighty persons qualified in the pharmaceutical and allied sciences whom it deems qualified to serve on the General Committee of Revision, together with a statement covering (1) the division or divisions of the work of revision for which each of them is best qualified and (2) the affiliations, academic and professional backgrounds and specific qualifications of each nominee.

The Nominating Committee shall indicate, whenever possible, twice the number of qualified persons to be elected to meet each need shown in the outline prepared and published by the Executive Committee of Revision.

Nominations from the floor for members of the General Committee of Revision shall be prepared on an official form, shall be seconded on the

floor by at least four delegates, and shall be accompanied by a written statement of qualifications which shall be presented to the Secretary of the Convention before the final session.

At the final session of the decennial meeting of the Pharmacopœial Convention, the Nominating Committee shall provide for each delegate two official printed ballots. One ballot shall contain the names of those nominated from the floor, for President, for Vice-President, for Secretary, and for Treasurer of the Pharmacopœial Convention, and for the six elected members of the Board of Trustees as provided by the Constitution and By-Laws. The second ballot shall contain the names of those nominated for the General Committee of Revision as recommended by the nominating committee, and also the names of those nominated from the floor, classified according to the needs of the subcommittee and shall designate the number to be elected in each category, as provided by the By-Laws.

Chapter IX

THE COMMITTEES ON CREDENTIALS AND ARRANGEMENTS

Article I. The Committee on Credentials shall consist of five members and shall be appointed by the President not less than two months before a meeting.

The Chairman of the Board of Trustees and the Secretary of the Pharmacopœial Convention shall be members, *ex-officio*, of the Committee on Credentials.

Article II. The Committee on Credentials shall examine carefully the credentials of all delegates. Credentials issued in blank, leaving the names of the delegates and alternates to be inserted subsequently by other than the regularly constituted officers of the appointing or electing associations or institutions, shall not be accepted as meeting the requirements of this chapter. Immediately before the meeting of the Pharmacopœial Convention, the Committee shall furnish its report to the Secretary of the Pharmacopœial Convention, who shall post in a conspicuous place in the convention hall, a roll containing the names of the officers of the Pharmacopœial Convention, the Board of Trustees, the General Committee of Revision and those delegates whose credentials are unquestioned and approved.

The Committee on Credentials shall make a report to the Pharmacopœial Convention concerning all credentials which have been questioned, or which appear to the Committee to be of doubtful validity. A major-

ity vote of the members of the Pharmacopœial Convention is required to overrule a decision of the Committee on Credentials.

ARTICLE III. The Committee on Arrangements shall consist of five members residing in or convenient to the City of Washington, D. C., or to such city as may have been selected by the Board of Trustees as provided in Article V of the Constitution, and appointed by the President. It shall make the necessary arrangements for holding a meeting of the Pharmacopœial Convention. The President and Secretary of the Pharmacopœial Convention and the Chairman of the Board of Trustees shall be *ex-officio* members of the Committee on Arrangements.

ARTICLE IV. Vacancies in these committees shall be filled by appointment by the President of the Pharmacopœial Convention.

CHAPTER X

MEMBERS

ARTICLE I. Each person designated as a delegate to the Pharmacopœial Convention shall present his credentials to the Committee on Credentials and upon report by that Committee that the credentials are unquestioned shall be admitted as a member of the Pharmacopœial Convention. All cases of doubtful or disputed credentials shall be finally settled by the Pharmacopœial Convention after report upon them shall have been made by the Committee on Credentials.

Alternates of absent accredited delegates are subject to the foregoing provisions.

ARTICLE II. Resignations of membership in the Pharmacopœial Convention shall be made in writing to the Secretary of the Convention. All resignations shall be acknowledged in writing by the Secretary and shall be reported to the Board of Trustees.

ARTICLE III. Any accredited delegate may be expelled for improper conduct or for violation of the Constitution or By-Laws by a vote of not less than two-thirds of the accredited delegates present and voting.

CHAPTER XI

MEETINGS

ARTICLE I. Meetings of the Pharmacopœial Convention shall be held as provided in Article V of the Constitution.

ARTICLE II. The order of business of each decennial meeting of the Pharmacopœial Convention shall be as follows, with such other items as the President of the Convention may direct. After the first session, the Secretary of the Convention shall read the minutes of the preceding ses-

sion immediately after the call to order. On all questions of procedure Robert's rules of order shall prevail.

1. Call to order.
2. Report of the Committee on Credentials and roll call.
3. President's address.
4. Report of the Secretary of the Pharmacopœial Convention.
5. Report of the Treasurer of the Pharmacopœial Convention.
6. Reports of:
   Chairman of the Board of Trustees.
   Secretary of the Board of Trustees.
   Director of Pharmacopœial Revision.
   Revision Committee, on general principles of revision.
   Special committees.
7. Proposed amendments to the Constitution.
8. Nominations for President, Vice-President, Secretary, and Treasurer, and for the six elected members of the Board of Trustees.
9. Report of the Nominating Committee on nominees for membership on the General Committee of Revision (with an opportunity for nominations from the floor).
10. Reports of committees.
11. Resolutions and new business.

Final Session

1. Election by vote on the official ballot, of the President, Vice-President, Secretary, and Treasurer, and of the six elected members of the Board of Trustees.
2. Announcement of the name of the Director of Pharmacopœial Revision.
3. Election by vote on the official ballot, of members of the General Committee of Revision.
4. Announcement of the result of the election of officers, Board of Trustees, and members of the General Committee of Revision, and installation of the officers-elect.
5. Resolutions and new business.
6. Adjournment.

Chapter XII

THE CORPORATE SEAL

Article I. The seal of the Corporation shall contain the words: "The United States Pharmacopœial Convention. Corporate—1900—

Seal, D. C." An alternate spelling, "Pharmacopeial" shall also be considered as official.

CHAPTER XIII

AMENDMENTS

ARTICLE I. Every proposition to alter or amend these By-Laws shall be submitted in writing and shall be supplemented in writing by at least five delegates, to the Secretary of the Convention who shall present it at the same session of the Convention. It may be acted upon at any subsequent session of the meeting, when, upon receiving the votes of at least three-fourths ot the accredited delegates present and voting, it shall become a part of the By-Laws.

CHAPTER XIV

ARTICLE I. These amendments to the By-Laws shall become effective in time for the 1950 Convention.

ABSTRACT OF THE PROCEEDINGS OF THE U. S. PHARMACOPŒIAL CONVENTION OF 1940

THE thirteenth meeting of the United States Pharmacopœial Convention was held at the Willard Hotel, Washington, D. C., May 14, 1940. The Convention was called to order by the President, Dr. Walter A. Bastedo, and the roll of the members of the Convention was read by the Secretary, L. E. Warren.

The President introduced the delegates from Cuba, Puerto Rico, and the Philippines, then called Vice-President H. A. B. Dunning to the chair, and delivered his address.

After the President's address, reviews of Pharmacopœial affiliations were presented on the following subjects:

The Relation of the Pharmacopœia to the Medical Profession, by Dr. Morris Fishbein, Editor of the A. M. A. Journal.

The Relation of the Pharmacopœia to the Pharmaceutical Profession, by Dr. E. F. Kelly, Secretary of the A. Ph. A.

The Relation of the Pharmacopœia to the Food and Drug Administration, by Walter G. Campbell, Commissioner of Food and Drugs, Food and Drug Administration, Federal Security Agency, Washington, D. C.

Reports were then presented by the Chairman of the Board of Trustees, James H. Beal. In Chairman Beal's report were several amendments to the Constitution and By-Laws drafted (adopted) and announced by the Board of Trustees. Consideration of these amendments, however, was postponed and the Convention adjourned for lunch.

At 2:45 P.M. the Convention reconvened and received the reports of the Secretary of the Board, Samuel C. Henry, and the Treasurer of the Convention, Samuel L. Hilton.

The report of the Chairman of the Committee of Revision, E. Fullerton Cook, was presented and a statement of suggested principles was offered by Robert C. Wilson as a guide in the preparation of the Pharmacopœia. These were referred to the Board of Trustees for consideration. The session adjourned at 5:45 P.M. and reassembled the following morning and immediately received and acted upon the report of the Committee on the President's address and the report of the Chairman of the Revision Committee. This was followed by the report of the Secretary of the Convention, L. E. Warren.

Dr. Fishbein then presented resolutions calling for the appointment of a special Committee to revise the Constitution and By-Laws of the

Pharmacopœial Convention and to report at an adjourned session of the Convention to be called within two years. The resolutions were approved.

The report of the Nominating Committee was then presented and the nominees for Officers of the Convention, the Board of Trustees, and the Committee of Revision were elected and installed.

Other resolutions and reports were presented by delegates and the general principles recommended to be followed in preparing future revisions of the Pharmacopœia, which had been prepared by the Executive Committee of Revision, were submitted, discussed, and adopted with only slight modification.

The Convention then acted upon the amendments to the Constitution and By-Laws which had been offered and the Convention adjourned at 12:30 P.M. on May 15, 1940, to reassemble on call to receive the report of the Committee on Constitution and By-Laws.

An Abstract of Proceedings of the 1940 Convention has been published by the Board of Trustees and may be obtained on application, and by enclosing 10 cents postage, to L. E. Warren, Secretary of the U. S. P. Convention, 2 Raymond St., Chevy Chase, Md.

THE MEMBERSHIP OF THE U. S. PHARMACOPŒIAL CONVENTION, INC., 1940

The Members of the U. S. Pharmacopœial Convention, Inc., of 1940 consisted of the officers of the convention of 1930, the Board of Trustees, the Committee of Revision of 1930–1940, and the following registered delegates:

U. S. GOVERNMENT SERVICES

Medical Department of the Army: Lt. Col. Albert W. Kenner, U. S. Army, Ft. Meyer, Va.

Medical Department of the Navy: Rear Admiral Harold W. Smith,† Naval Medical Center, Washington, D. C.

U. S. Public Health Service: James P. Leake, National Institute of Health, Bethesda, Md.; Walter T. Harrison, 1851 Columbia Road, Washington, D. C.; M. I. Smith, National Institute of Health, Washington, D. C.

U. S. Department of Agriculture: Herbert O. Calvery,* Food and Drug Administration, Washington, D. C.; Theodore G. Klumpp, 33 Riverside Drive, Rensselaer, N. Y.; A. G. Murray, Food and Drug Administration, Washington, D. C.

U. S. Department of Commerce: C. C. Concannon, Bureau of Foreign and Domestic Commerce, Washington, D. C.; E. A. Chapman, Bureau of Foreign and Domestic Commerce, Washington, D. C.; Edward Wichers, National Bureau of Standards, Washington, D. C.

† Rear Admiral Smith was appointed by the Surgeon General, his credentials were accepted, but he was unable to attend the Convention because of other duties.

* Deceased.

NATIONAL ORGANIZATIONS

Association of Official Agricultural Chemists: W. F. Reindollar, Department of Health, Bureau of Chemistry, Baltimore, Md.; W. W. Skinner, Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, Washington, D. C.; Lewis E. Warren, 2 Raymond St., Chevy Chase, Md.

National Association of Boards of Pharmacy: George A. Moulton, Peterborough, N. H.; Robert L. Swain, Drug Topics, 330 W. 42nd St., New York, N. Y.; A. C. Taylor, 1733 Upshur St. N. W., Washington, D. C.

American Chemical Society: Joseph Rosin, Merck & Co., Inc., Rahway, N. J.; John F. Ross, J. T. Baker Chemical Co., Phillipsburg, N. J.; E. H. Volwiler, Abbott Laboratories, North Chicago, Ill.

Association of Food and Drug Officials of the United States: H. J. Fisher, Agricultural Experiment Station, New Haven, Conn.; W. A. Queen, Department of Agriculture, Raleigh, N. C.

American Veterinary Medical Association: H. E. Moskey, Food and Drug Administration, Washington, D. C.; Russell L. Mundhenk, % Lederle Laboratories, Pearl River, N. J.

American Pharmaceutical Manufacturers' Association: John G. Searle, 4737 Ravenswood Avenue, Chicago, Ill.; Russell J. Fosbinder, 250 High St., Newark, N. J.; Charles E. Vanderkleed, 2900 North 17th St., Philadelphia, Pa.

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American Hospital Association: Worth L. Howard, City Hospital of Akron, Akron, O.

The National Association of Retail Druggists: John W. Dargavel, 205 West Wacker Drive, Chicago, Ill.; John A. Goode, 53 Patton Ave., Asheville, N. C.

American Drug Manufacturers' Association: S. DeWitt Clough, Abbott Laboratories, North Chicago, Ill.; Carson P. Frailey, 506 Albee Building, Washington, D. C.; F. O. Taylor, Parke, Davis & Co., Detroit, Mich.

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ALABAMA

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The Howard College, Department of Pharmacy: Benton C. Shafer, The Howard College, Birmingham, Ala.; John R. Warren, Birmingham, Ala.

ARIZONA

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ARKANSAS

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CALIFORNIA

College of Medical Evangelists: Lester H. Lonergan, Loma Linda, Cal.

University of California, College of Pharmacy: Carl L. A. Schmidt,* University of California, College of Pharmacy, Medical Center, San Francisco, Cal.

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COLORADO

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CUBA

Academia de Ciencias Médicas, Físicas y Naturales de la Habana: Francisco Hidalgo. Calle B entre 12 y 14, Reparto Almendares, Habana, Cuba.

University of Havana, School of Pharmacy: Celestino Garcia Morales, Maximo Gomez 414, Habana, Cuba; Maria Amelia Mesa de Ponce, Calle Juan Delgado 455, Habana, Cuba.

Asociación Farmacéutica Nacional: Eduardo Palacios Planas, Neptuno 866 1er. piso derecha, Habana, Cuba; Jorge A. Dominicis, Malecon 307, Habana, Cuba.

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IOWA

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Drake University, College of Pharmacy: F. S. Bukey, University of Nebraska, Lin-

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coln, Neb.; Elbert O. Kagy, Drake University, Des Moines, Ia.; Denny Brann,* *720 Locust St., Des Moines, Ia.*

KANSAS

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KENTUCKY

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MARYLAND

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Johns Hopkins University, School of Medicine: E. K. Marshall, Jr., Johns Hopkins Medical School, Baltimore, Md.; Morris Rosenfeld, Johns Hopkins Medical School, Baltimore, Md.; Perrin H. Long, Johns Hopkins Medical School, Baltimore, Md.

Johns Hopkins University, School of Hygiene and Public Health: Olaf S. Rask, 615 N. Wolfe St., Baltimore, Md.

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* Deceased.

MASSACHUSETTS

Massachusetts Medical Society: Soma Weiss,* Peter Bent Brigham Hospital, Boston, Mass.; Harold J. Jeghers, 80 East Concord St., Boston, Mass.; William B. Castle, Boston City Hospital, Boston, Mass.

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Harvard University, Medical School: Otto Krayer, Harvard Medical School, Boston, Mass.; Henry Knowles Beecher, Massachusetts General Hospital, Boston, Mass.; Charles Lyman Short, 264 Beacon St., Boston, Mass.

Massachusetts College of Pharmacy: Ralph R. Patch, 179 Longwood Ave., Boston, Mass.; Heber W. Youngken, 179 Longwood Ave., Boston, Mass.; Howard C. Newton, 179 Longwood Ave., Boston, Mass.

Tufts College, Medical School: Robert W. Buck, 416 Huntington Ave., Boston, Mass.

Boston University, School of Medicine: Walter L. Mendenhall, 80 East Concord St., Boston, Mass.; Edward C. Merrill, 43 Leon St., Boston, Mass.

College of Physicians and Surgeons: Frederick W. Connolly, 7 Fenno Place, Dorchester, Mass.; Sidney Hyman Harmon, 282 Columbia Road, Roxbury, Mass.

MICHIGAN

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Michigan State Pharmaceutical Association: W. W. F. Enz, Kalamazoo, Mich.; E. D. Mayo, Kalamazoo, Mich.

Ferris Institute, College of Pharmacy: Simon Benson, Ferris Institute, Big Rapids, Mich.; Frank T. Gillespie, 220 State St., St. Joseph, Mich.; A. G. Buchman, Iron Mountain, Mich.

University of Michigan, Medical School: Charles W. Edmunds,* University of Michigan, Medical School, Ann Arbor, Mich.; Ralph G. Smith, University of Michigan, Medical School, Ann Arbor, Mich.

Wayne University, College of Medicine: John D. Ralston, 4118 Courville Rd., Detroit, Mich.

Wayne University, College of Pharmacy: Roland T. Lakey,† College of Pharmacy, Wayne University, Detroit, Mich.; Leonard A. Seltzer,* College of Pharmacy, Wayne University, Detroit, Mich.; Neulon Deahl, Parke, Davis Co., Detroit, Mich.; R. L. McCabe,* Detroit, Mich.

University of Michigan, College of Pharmacy: Charles H. Stocking, College of Pharmacy, University of Michigan, Ann Arbor, Mich.; Howard B. Lewis, College of Pharmacy, University of Michigan, Ann Arbor, Mich.

MINNESOTA

Minnesota State Medical Association: A. E. Osterberg, Mayo Clinic, Rochester, Minn.; R. N. Bieter, University of Minnesota, Minneapolis, Minn.

* Deceased.

† Resigned at the close of the first day. The vacancy was filled by his alternate, R. L. McCabe.

Minnesota State Pharmaceutical Association: Glenn L. Jenkins, Purdue University, College of Pharmacy, Lafayette, Ind.; F. W. Moudry, 364 St. Peter St., St. Paul, Minn.; Hallie F. Bruce, University Hospital, University of Minnesota, Minneapolis, Minn.

University of Minnesota, College of Pharmacy: Charles H. Rogers, University of Minnesota, Minneapolis, Minn.; Earl B. Fischer, University of Minnesota, Minneapolis, Minn.; Charles V. Netz, University of Minnesota, Minneapolis, Minn.

University of Minnesota, Medical School: Raymond M. Amberg, University of Minnesota Hospital, Minneapolis, Minn.; Arthur D. Hirschfelder,* University of Minnesota, Medical School, Minneapolis, Minn.; Harold N. Wright, University of Minnesota, Medical School, Minneapolis, Minn.

MISSISSIPPI

Mississippi State Pharmaceutical Association: Lew Wallace, Laurel, Miss.; W. H. Rose, West Point, Miss.; Chas. E. Wilson, Corinth, Miss.

University of Mississippi, School of Pharmacy: Gilbert L. Harvey, 5250 Market St., Philadelphia, Pa.; L. C. Bird, 915 E. Cary St., Richmond, Va.; Carson G. Frailey, 302 Albee Bldg., Washington, D. C.

MISSOURI

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MONTANA

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Montana State Medical Association: Stuart Foster, 1726 Eye St., N. W., Washington, D. C.; A. D. Daughton, East Falls Church, Va.; William P. Argy, 1150 Connecticut Ave., Washington, D. C.

Montana State Pharmaceutical Association: Leon W. Richards, Howard College, Dept. of Pharmacy, Birmingham, Ala.

NEBRASKA

Nebraska Pharmaceutical Association: Joseph B. Burt, 1520 Cheyenne St., Lincoln Nebr.; Lewis E. Harris, 1920 Jefferson Ave., Lincoln, Nebr.

University of Nebraska, College of Pharmacy: Rufus A. Lyman, University of Nebraska, Lincoln, Nebr.; Paul J. Jannke, University of Nebraska, Lincoln, Nebr.; Harold G. O. Holck, University of Nebraska, Lincoln, Nebr.

Creighton University, School of Medicine: Edward Hays, Church and Dwight Company, Inc., 70 Pine Street, New York, N. Y.

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Creighton University, College of Pharmacy: William A. Jarrett, Creighton University, College of Pharmacy, Omaha, Nebr.; John E. O'Brien, 17th & Douglas Sts., Omaha, Nebr.

NEW HAMPSHIRE

Dartmouth Medical School of Dartmouth College: Clarence J. Campbell, Nathan Smith Laboratory, Hanover, N. H.

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NEW JERSEY

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Literary and Scientific Society of the German Apothecaries of the City of New York: Robert S. Lehman,* 295 Washington Ave., Brooklyn, N. Y.; Bruno Dauscha, 425 East 86th St., New York, N. Y.

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OHIO

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PUERTO RICO

University of Puerto Rico, College of Pharmacy: José Menéndez, University of Puerto Rico, Rio Piedras, P. R.

Colegio de Farmacéuticos de Puerto Rico: Gilberto Rivera Hernández, School of Tropical Medicine, San Juan, P. R.

School of Tropical Medicine: Joseph H. Axtmayer, School of Tropical Medicine, San Juan, P. R.

RHODE ISLAND

Rhode Island College of Pharmacy: Albert W. Claflin, 150 Dorrance St., Providence, R. I.; W. Henry Rivard, 235 Benefit St., Providence, R. I.; John J. Pastille, 269 Washington St., Providence, R. I.

Rhode Island Pharmaceutical Association: Timothy J. Connors, Jr., 18 Broad St., Westerly, R. I.; Charles F Gilson, Centredale, R. I.; Leo C. Clark,* 5 North Union St., Pawtucket, R. I.

SOUTH CAROLINA

Medical College of the State of South Carolina, School of Pharmacy: W. H. Zeigler, Medical College of the State of South Carolina, Charleston, S. C.; J. H. Hoch, Medical College of the State of South Carolina, Charleston, S. C.

University of South Carolina, School of Pharmacy: E. T. Motley, 711 Bull St., Columbia, S. C.

South Carolina Medical Society: Robert Wilson, 165 Rutledge Ave., Charleston, S. C.

SOUTH DAKOTA

South Dakota State College of Agriculture and Mechanical Arts, Division of Pharmacy: Floyd J. LeBlanc, Brookings, S. D.; Clark T. Eidsmoe, Brookings, S. D.

South Dakota Pharmaceutical Association: E. C. Severin, Philip, S. D.; Kenneth Jones, Gettysburg, S. D.

* Deceased.

TENNESSEE

University of Tennessee, School of Pharmacy: Robert L. Crowe, 874 Union Ave., Memphis, Tenn.; A. John Schwarz,* University of Tennessee, Memphis, Tenn.; Alan Hisey, 1335 H St., N. W., Washington, D. C.

University of Tennessee, College of Medicine: J. A. Crabtree, National Institute of Health, Washington, D. C.; J. B. Griffith, 1746 K St., N. W., Washington, D. C.

Vanderbilt University, School of Medicine: Benjamin H. Robbins, 1611—17th Ave., South, Nashville, Tenn.

TEXAS

Texas Pharmaceutical Association: Eugene G. Eberle,* Constitution Ave. and 22nd St., N. W., Washington, D. C.

University of Texas, College of Pharmacy: William Francis Gidley, University of Texas, Austin, Texas.

VERMONT

University of Vermont, College of Medicine and State Agricultural College: Paul K. French, 223 Pearl St., Burlington, Vt.; C. S. Leonard, 31 Cliff St., Burlington, Vt.; T. H. Harwood, 1 Handy Court, Burlington, Vt.

Vermont Pharmaceutical Association: Ray S. Kelley, Massachusetts College of Pharmacy, 179 Longwood Ave., Boston, Mass.

VIRGINIA

University of Virginia, Department of Medicine: Andrew deJ. Hart, University Station, Charlottesville, Va.

Medical College of Virginia, School of Medicine: Rolland J. Main, Medical College of Virginia, Richmond, Va.

Medical Society of Virginia: Harvey B. Haag, Medical College of Virginia, Richmond, Va.; J. A. Waddell, University of Virginia, Charlottesville, Va.; Harold W. Miller, Woodstock, Va.

Medical College of Virginia, School of Pharmacy: Wortley F. Rudd, Medical College of Virginia, Richmond, Va.; R. W. Miller, 2401 North Ave., Richmond, Va.; J. A. Reese, University of Kansas, Lawrence, Kansas.

Virginia Pharmaceutical Association: A. L. I. Winne, 105 State Office Bldg., Richmond, Va.; E. P. Berlin, Berryville, Va.; C. L. Guthrie, 130 South Avenue, Petersburg, Va.

WASHINGTON

University of Washington, College of Pharmacy: Forest J. Goodrich, University of Washington, College of Pharmacy, Seattle, Wash.; Charles W. Johnson, University of Washington, College of Pharmacy, Seattle, Wash.; L. Wait Rising, University of Washington, College of Pharmacy, Seattle, Wash.

State College of Washington, School of Pharmacy: T. Lowell Swenson, Bureau of Agricultural Chemistry & Engineering, Regional Laboratory, U. S. Department of Agriculture, Berkeley, Cal.; Glenn K. Smith, Medical Station Hospital, Fort Sam Houston, Texas.

* Deceased.

Washington Pharmaceutical Association: H. A. Langenhan, Mercer Island, Wash.

Washington State Medical Association: Paul W. Spickard, 43 Leon St., Boston, Mass.; Clare O. Ewing, 43 Leon St., Boston, Mass.

WEST VIRGINIA

University of West Virginia, College of Pharmacy: J. Lester Hayman, University of West Virginia, College of Pharmacy, Morgantown, W. Va.; G. A. Bergy, University of West Virginia, College of Pharmacy, Morgantown, W. Va.; F. L. Geiler, University of West Virginia, College of Pharmacy, Morgantown, W. Va.

University of West Virginia, School of Medicine: George A. Emerson, School of Medicine, West Virginia University, Morgantown, W. Va.; E. Ross Hart, University of West Virginia, School of Medicine, Morgantown, W. Va.

West Virginia State Pharmaceutical Association: Fred A. McFarlin, Adamston Drug Store, Clarksburg, W. Va.; Rodney A. Barb, Parsons, W. Va.; J. A. Patterson, Martinsburg, W. Va.

WISCONSIN

Wisconsin Pharmaceutical Association: Sylvester H. Dretzka, 773 N. Prospect Ave., Milwaukee, Wis.; John J. Possehl, 835-A N. 22nd St., Milwaukee, Wis.; Emerson D. Stanley, 625 N. Milwaukee St., Milwaukee, Wis.

Marquette University, School of Medicine: Harry Beckman, Marquette University, School of Medicine, Milwaukee, Wis.

University of Wisconsin, School of Pharmacy: A. H. Uhl, Chemistry Bldg., Madison, Wis.; W. O. Richtmann, Chemistry Bldg., Madison, Wis.; L. M. Parks, Chemistry Bldg., Madison, Wis.

Wisconsin State Medical Society: Theodore Wiprud, Medical Society of the District of Columbia, Washington, D. C.

GENERAL PRINCIPLES RECOMMENDED BY THE U. S. P. CONVENTION OF 1940, TO BE FOLLOWED IN REVISING THE PHARMACOPŒIA

1. *Object and Scope of the Pharmacopœia*—The object of the Pharmacopœia is to provide standards for drugs and medicines of therapeutic usefulness or pharmaceutical necessity, sufficiently used in medical practice within the United States or its possessions; to lay down tests for the identity, quality, and purity of these; to insure, so far as practicable, uniformity in physical properties and active constituents.

It is recommended that the Committee of Revision be authorized to admit into the Pharmacopœia a carefully selected list of medicinal substances of known origin, but no substance or combination of substances shall be introduced if either the composition or mode of manufacture thereof be kept secret. A statement shall be placed in the Preface to the effect that standards for purity and strength, described in the text of the Pharmacopœia, are intended to apply solely to substances which are to be used for medicinal purposes, or for determining their identity and purity.

2. *Doses*—It is recommended that for Pharmacopœial substances which are intended for therapeutic purposes, the Committee of Revision be instructed to state, where feasible, the average (neither minimum nor maximum) doses for adults, and, where deemed advisable, also for children. The term "average dose" is to be interpreted as the dose which might reasonably be expected to produce the therapeutic effect for which the substance is most commonly employed. The metric system is to be used, followed by approximate equivalents in apothecaries' weights and measures. It is to be understood that neither this Convention nor the Committee of Revision created by it intends to have these doses regarded as obligatory on the physician or as forbidding him to exceed the dose given, whenever, in his judgment, this may seem advisable; the Committee of Revision shall make a declaration to this effect in some prominent place in the Pharmacopœia.

3. *Nomenclature*—It is recommended that changes in the titles of articles at present official be made only for the purpose of insuring greater accuracy, brevity, or safety in dispensing or to provide conformity with international usage, and to eliminate therapeutically suggestive titles.

In the case of newly admitted articles, it is recommended that such titles be chosen as are in harmony with general usage and convenient for prescribing; for synthetic chemicals, with lengthy or unwieldy

names, the Committee of Revision shall be empowered to coin short titles, preferably based upon the true chemical names, but in the case of chemicals of definite composition the scientific name shall be given, at least as a synonym.

There may also be inserted, after each official English title, an abbreviated title, to be known as the official abbreviation.

It is recommended that botanical and zoölogical names shall conform to the rules of the International Botanical Congress and the International Zoölogical Congress, and that chemical names shall conform, so far as possible, to those used in *Chemical Abstracts*, published by the American Chemical Society.

4. *Synonyms*—It is recommended that the use of synonyms shall be continued and that the synonyms shall be printed in the text of the Pharmacopœia immediately after the official English title of the substance. When a substance is known in commerce under more than one commonly used English name, such vernacular titles shall, as far as desirable, be given as synonyms. A statement shall be made in the Preface of the Pharmacopœia that substances designated by an official synonym must comply with the same standards, tests, and requirements as are demanded for the substances under the official title.

5. *Standards for Purity, Quality, and Strength*—It is recommended that the Committee of Revision be instructed to provide standards of purity, quality, and strength for Pharmacopœial substances for which limiting tests are or may be given. While no concession should be made toward diminution of medicinal value, an allowance may be made for unavoidable innocuous impurities. Official preparations are to be made only from drugs that conform to the Pharmacopœial standards, definitions, and descriptions. Vegetable drugs are to be as free as practicable from insects or other animal life, animal material, or animal excreta. They are to be free from moldiness and shall show no discoloration, abnormal odor, sliminess, or deterioration due to any cause.

6. *International Standards*—It is recommended that potent remedies be made to conform to the standards of the International Commission of Pharmacopœial Experts in so far as it is deemed advisable by the Committee of Revision.

7. *General Formulas and Methods*—It is recommended that general formulas for the manufacture of pharmaceutical preparations and general methods for the examination of drugs and tests for chemicals and preparations be given when practicable, and that the application

of these formulas and methods be indicated by reference in the respective monographs.

8. *Appending the Title or Titles of Preparations in Which an Official Substance Is Used*—It is recommended that there shall be included in the monograph of each substance the title or titles of the official preparation or preparations in which it is an essential therapeutic ingredient.

9. *Alcoholic Percentage in Official Preparations*—It is recommended that the permissible range for the content of absolute alcohol, by volume, be included in the monograph of each preparation containing significant quantities of alcohol.

10. *Assay Processes*—It is recommended that assay processes shall be included for as many of the drugs and preparations made therefrom as may be found practicable, and which lead to fairly uniform results when applied by different analysts; wherever feasible, tests for identity and purity are to be given for the products of such assays.

11. *Reference Standards*—It is recommended that the policy of establishing and distributing Reference Standards be approved and continued.

12. *Weights and Measures*—It is recommended that the Committee of Revision be instructed to retain the metric system of weights and measures.

13. *Atomic Weights*—It is recommended that the atomic weights adopted in the revision shall be in accordance with the latest available report of the International Committee on Chemical Elements.

14. *Physical Constants*—It is recommended that official methods for determining physical constants shall be stated in the Pharmacopœia, and these shall apply to all articles in which physical constants are officially used, unless specifically excepted.

15. *Standard Temperature*—It is recommended that the standard temperature of 25° C. (77° F.) be retained (except for alcohol or other special cases).

16. *Alcoholometric Tables*—It is recommended that an alcoholometric table be inserted giving the percentages of alcohol at different temperatures.

17. *Pharmacognostic Descriptions*—It is recommended that the descriptions of crude drugs shall include brief, pharmacognostic descriptions, both macroscopic and microscopic where practicable; and, as a means of detecting adulteration, there shall be added a statement of the appearance of the distinctive structural elements in the powder, when examined microscopically.

18. *Powdered Drugs*—It is recommended that powdered drugs be required to represent the entire drug unless specifically stated otherwise.

19. *Solubilities*—It is recommended that pharmaceutically useful solubilities be given as completely as practicable.

20. *Sterilization*—It is recommended that a chapter on sterilization be retained.

21. *Publicity*—It is recommended that the Committee of Revision make public, for comment and criticism, important changes in preparations and standards proposed, before final adoption.

22. *Formulation of Rules*—In all matters not especially provided for by the Convention, the Committee of Revision is empowered to formulate such rules as it considers necessary.

23. *Date When Pharmacopœias Become Official*—It is recommended that the Board of Trustees, after consultation with the Committee of Revision, announce a definite date, reasonably distant from the actual date of publication, when each Pharmacopœia is to become official, and it is recommended that this date be printed on the title page of the new Pharmacopœia.

24. *Spanish Edition*—It is recommended that each revision of the United States Pharmacopœia be translated into the Spanish language and published.

25. *Interim Revisions*—It is recommended that the Committee of Revision be authorized to prepare Interim Revisions providing for admissions to or changes in the Pharmacopœia and to issue the same separately as "Interim Announcements" or collectively as "Supplements." It is recommended that the Board of Trustees, after consultation with the Committee of Revision, shall announce a definite date, reasonably distant from the actual date of publication, when the interim revision is to become official, and it is recommended that this date be printed upon each announcement or supplement.

26. *The Pharmacopœia of the United States of America*—Where the words "Pharmacopœia" or "United States Pharmacopœia" appear in these General Principles or elsewhere in this book, they refer to the Pharmacopœia of the United States of America.

ABSTRACT OF PROCEEDINGS OF THE ADJOURNED MEETING OF THE U. S. P. CONVENTION OF APRIL, 1942

THE adjourned meeting of the U. S. P. Convention, for the purpose of receiving and acting upon the report of a Committee authorized by the 1940 Convention to revise the Constitution and By-Laws, was called to order by the President, Dr. Cary Eggleston, on Tuesday morning, April 7, 1942, at Cleveland, Ohio.

The death of President Dr. Charles W. Edmunds and of other prominent pharmacopœial workers was called to the attention of the Convention and all delegates stood in silent tribute.

It was announced by the Board of Trustees that, upon the advice of legal counsel, the alteration of the Constitution adopted at the 1940 Convention would not be permissible until the meeting of the 1950 Convention due to restricting constitutional provisions. The revision of the By-Laws, however, would be possible, provided the revision would not conflict with the Constitution.

The proposed By-Laws were presented, Article by Article, and after discussion and some further revision, they were approved as the working By-Laws of the Convention (see page xlvii).

The Committee submitted a suggested revision of the Constitution which is to be studied and again reviewed by the Board of Trustees prior to the 1950 Convention at which time all Constitutional requirements for revision will have been met and the proposed Constitution (see Abstract of Proceedings of the 1942 Adjourned Meeting, page 44) may be acted upon.

The Committee on Constitution and By-Laws was continued and requested to report in ample time for its recommendations to be considered in advance of the 1950 Convention.

An abstract of Proceedings of the adjourned meeting has been published by the Board of Trustees and may be obtained on application, and by enclosing 10 cents postage, to L. E. Warren, Secretary of the U. S. P. Convention, 2 Raymond Street, Chevy Chase, Maryland.

The following delegates were present at the adjourned meeting:

U. S. GOVERNMENT SERVICES

United States Army:†
U. S. Department of Agriculture:
Theodore G. Klumpp

NATIONAL ORGANIZATIONS

Association of Official Agricultural Chemists:
Lewis E. Warren

† Col. Kenner was unable to attend. The Surgeon General detailed Col. Wm. L. Fox to be present as an observer.

National Association of Boards of Pharmacy:
George A. Moulton
Robert L. Swain

American Chemical Society:
Joseph Rosin
John F. Ross

American Veterinary Medical Association:
Russell L. Mundhenk

American College of Physicians:
Charles F. Tenney
Torald Sollmann

American Drug Manufacturers' Association:
Carson P. Frailey
F. O. Taylor

National Wholesale Druggists' Association:
E. L. Newcomb

American Medical Association:
Morris Fishbein

American Dental Association:
Thomas J. Hill
Harold L. Hansen

American Pharmaceutical Association:
E. F. Kelly*
Justin L. Powers

ARKANSAS

Arkansas Pharmaceutical Association:
Frank A. Delgado

CALIFORNIA

University of California, College of Pharmacy:
Carl L. A. Schmidt*

COLORADO

Colorado Pharmacal Association:
Paul G. Stodghill

DISTRICT OF COLUMBIA

George Washington University, School of Pharmacy:
W. Paul Briggs

FLORIDA

Florida Medical Association:
William Emrich

GEORGIA

Medical Association of Georgia:
Allen H. Bunce

University of Georgia, School of Pharmacy:
Robert C. Wilson

ILLINOIS

Loyola University, School of Medicine:
Harold N. Ets

University of Illinois, College of Pharmacy:
Elmer H. Wirth

INDIANA

Indiana State Medical Association:
Samuel Kennedy

Indiana University, School of Medicine:
Frank B. Fisk
C. R. Schaefer

Valparaiso University, College of Pharmacy:
C. J. Klemme

Purdue University, School of Pharmacy:
Francis E. Bibbins

Indiana Pharmaceutical Association:
Carl E. Nelson

Indianapolis College of Pharmacy:
Edward H. Niles
Waldon F. Ambroz

IOWA

University of Iowa, College of Pharmacy:
Louis C. Zopf

Iowa Pharmaceutical Association:
George Judisch

KENTUCKY

Kentucky State Medical Association:
Virgil E. Simpson*

LOUISIANA

Tulane University of Louisiana, School of Medicine
Erwin E. Nelson

MARYLAND

Maryland University, School of Medicine:
John C. Krantz, Jr.

Maryland University, School of Pharmacy:
A. G. DuMez

MASSACHUSETTS

Massachusetts Pharmaceutical Association:
Martin E. Adamo

Massachusetts College of Pharmacy:
Howard C. Newton

College of Physicians and Surgeons:
Frederick W. Connolly

* Deceased.

MICHIGAN

University of Michigan, Medical School:
Ralph G. Smith

Wayne University, College of Pharmacy:
Leonard A. Seltzer*

University of Michigan, College of Pharmacy:
Charles H. Stocking
Howard B. Lewis

MINNESOTA

University of Minnesota, College of Pharmacy:
Charles H. Rogers

University of Minnesota, Medical School:
Raymond M. Amberg

MONTANA

Montana State Pharmaceutical Association:
Leon W. Richards

NEBRASKA

Nebraska Pharmaceutical Association:
Joseph B. Burt

University of Nebraska, College of Pharmacy:
Harald G. O. Holck

NEW HAMPSHIRE

Dartmouth College, Dartmouth Medical School:
Clarence J. Campbell

NEW JERSEY

Rutgers University, New Jersey College of Pharmacy:
Ernest Little

New Jersey Pharmaceutical Association:
Robert P. Fischelis
Robert S. Sherwin

NEW YORK

Columbia University, College of Physicians and Surgeons:
Walter A. Bastedo
Anna E. Grosso

Cornell University, Medical College:
McKeen Cattell
R. Gordon Douglas
Cary Eggleston

Medical Society of the State of New York:
Harry Gold
Albert F. R. Andresen

NORTH DAKOTA

North Dakota Pharmaceutical Association:
P. H. Costello

* Deceased.

OHIO

Ohio State University, College of Medicine:
Clayton S. Smith

Western Reserve University, School of Pharmacy:
Edward Spease

Ohio State University, College of Pharmacy:
B. V. Christensen

The Northern Ohio Druggists' Association:
A. P. Gegenheimer
Jos. T. Matousek
Harry G. Baskind

The Ohio State Pharmaceutical Association:
M. N. Ford

The Ohio State Medical Association:
Samuel Rosenfeld, Jr.

OKLAHOMA

University of Oklahoma, School of Medicine:
H. A. Shoemaker

PENNSYLVANIA

Temple University, School of Pharmacy:
H. Evert Kendig

Temple University, Medical School and Hospital:
A. E. Livingston

Alumni Association of the Philadelphia College of Pharmacy and Science:
Adley B. Nichols

University of Pennsylvania, School of Medicine:
Horatio C. Wood, Jr.

University of Pittsburgh, School of Medicine:
George J. Pastorius
J. M. Rogoff

Duquesne University, School of Pharmacy:
Hugh C. Muldoon

University of Pittsburgh, College of Pharmacy:
C. Leonard O'Connell

Mellon Institute of Industrial Research:
George D. Beal

Philadelphia College of Pharmacy and Science:
E. Fullerton Cook

RHODE ISLAND

Rhode Island College of Pharmacy:
W. Henry Rivard
John J. Pastille

Rhode Island Pharmaceutical Association:
Timothy J. Connors, Jr.
Charles F. Gilson
Leo C. Clark*

TENNESSEE

Vanderbilt University, School of Medicine.
Benjamin H. Robbins

VERMONT

Vermont Pharmaceutical Association:
Ray S. Kelley

VIRGINIA

Medical College of Virginia, School of Pharmacy:
Wortley F. Rudd

Medical Society of Virginia:
Harvey B. Haag

WASHINGTON

Washington State Medical Association:
Paul W. Spickard
Clare O. Ewing

WISCONSIN

Wisconsin Pharmaceutical Association:
Sylvester H. Dretzka

* Deceased.

INTERNATIONAL PROTOCOL (P. I.) STANDARDS*

(Brussels Conference, 1925)

Compared with Drugs and Preparations of the U. S. P. XIII

International Protocol (P. I.)	U. S. P. XIII
ARSENIC	
Natrii Arsenas Crystalline salt 36.85 per cent of arsenic pentoxide.	Not official in the U. S. P. XIII.
Solutio arsenicalis seu Fowleri Neutral solution. 1 per cent of arsenic trioxide.	**Potassium Arsenite Solution** 100 cc. contains 1 Gm. of As_2O_3.
BELLADONNA	
Atropa Belladonna L.	**Atropa Belladonna L.**
Belladonnæ folium Dried leaf.	**Belladonna Leaf** Dried leaf and top; 0.3 per cent of alkaloids.
Pulvis Belladonnæ 0.3 per cent of total alkaloids. Diluent, rice starch.	Included under *Belladonna Leaf*.
Tinctura Belladonnæ 0.03 per cent of total alkaloids. Menstruum, 70 per cent alcohol.	**Belladonna Tincture** 0.03 per cent of total alkaloids. Menstruum, 71 per cent alcohol.
Extractum Belladonnæ 1.30 per cent of total alkaloids. Menstruum, 70 per cent alcohol. Evaporate extract below 50° C. Free from chlorophyll.	**Belladonna Extract** 1.25 per cent of total alkaloids. Menstruum, 71 per cent alcohol for the pilular extract and alcohol for the powdered extract. Evaporate at not over 60° C. No requirement. Both pilular and powdered extract included.
Sirupus Belladonnæ Contains 5 per cent of Tinctura Belladonnæ.	Not official in the U. S. P. XIII.
Unguentum Belladonnæ 10 per cent of Extractum Belladonnæ.	**Belladonna Ointment** 10 per cent of pilular belladonna extract.
COCAINE HYDROCHLORIDE	
Cocaini hydrochloridum Anhydrous salt.	**Cocaine Hydrochloride** Anhydrous salt.

*Alcohol and acids referred to in the menstrua of U. S. P. preparations listed in this table are those of Pharmacopœial strength.

DIGITALIS

International Protocol (P. I.)	U. S. P. XIII
Digitalis purpurea L.	Digitalis purpurea L.
Digitalis folium Leaf, dried at 55° to 60° C.	Digitalis Dried leaf. Biologically standardized: 0.1 Gm. equivalent to not less than 1 U. S. P. Digitalis unit (equivalent to 1 International unit).
Pulvis Digitalis	Powdered Digitalis Biologically standardized: 0.1 Gm. equivalent to 1 U. S. P. Digitalis unit.
Sirupus Digitalis Contains 5 per cent of Tincture of Digitalis.	Not official in the U. S. P. XIII.
Tinctura Digitalis 10 per cent of the drug by weight. Menstruum, 70 per cent alcohol.	Digitalis Tincture Biologically standardized: 1 cc. equivalent to 1 U. S. P Digitalis unit. Menstruum, 76 per cent alcohol.

HYOSCYAMUS

International Protocol (P. I.)	U. S. P. XIII
Hyoscyamus niger L.	Hyoscyamus niger L.
Hyoscyami folium Leaf, dried.	Hyoscyamus Dried leaf, with or without tops. 0.040 per cent of hyoscyamus alkaloids.
Extractum Hyoscyami Menstruum, 70 per cent alcohol. Evaporate extracts below 50° C. Free from chlorophyll.	Not official in U. S. P. XIII.
Tinctura Hyoscyami 10 per cent of the drug by weight. Menstruum, 70 per cent alcohol.	Hyoscyamus Tincture 100 cc. yields 0.0040 Gm. of hyoscyamus alkaloids. Menstruum, 71 per cent alcohol.

IODINE

International Protocol (P. I.)	U. S. P. XIII
Solutio iodi spirituosa Iodine 6.5 Gm., potassium iodide 2.5 Gm., or a corresponding quantity of sodium iodide. Alcohol (90 per cent) 91 Gm.	Iodine Tincture Iodine 2 Gm., sodium iodide 2.4 Gm., diluted alcohol sufficient to make 100 cc.

IPECAC

International Protocol (P. I.)	U. S. P. XIII
Uragoga Ipecacuanha H. Bn.	Cephaëlis Ipecacuanha (Brot.) A. Rich. Cephaëlis acuminata Karsten
Ipecacuanhæ radix Dried root.	Ipecac Dried rhizome and roots. 2 per cent of ether-soluble alkaloids.
Pulvis Ipecacuanhæ 2 per cent of total alkaloids.	Included under Ipecac.
Tinctura Ipecacuanhæ 0.2 per cent of total alkaloids. Menstruum, 70 per cent alcohol.	Not official in the U. S. P. XIII.

International Protocol (P. I.)	U. S. P. XIII
Sirupus Ipecacuanhæ Contains 10 per cent of Tinctura Ipecacuanhæ.	**Ipecac Syrup** Contains 7 per cent of ipecac fluid-extract, making the syrup about seven times stronger than the P. I. Sirup.

MERCURY

International Protocol (P. I.)	U. S. P. XIII
Sirupus hydrargyri iodidi cum kalii iodido 0.05 per cent of mercuric iodide and 2.5 per cent of potassium iodide.	Not official in the U. S. P. XIII.
Unguentum hydrargyri 30 per cent of mercury.	**Mild Mercurial Ointment** 10 per cent of mercury. **Strong Mercurial Ointment** 50 per cent of mercury.

MORPHINE

International Protocol (P. I.)	U. S. P. XIII
Sirupus morphini 0.05 per cent of morphine hydrochloride.	Not official in the U. S. P. XIII.

OPIUM

International Protocol (P. I.)	U. S. P. XIII
Papaver somniferum L.	**Papaver somniferum L. or Papaver album De Candolle**
Opium Dried latex of the fruit.	**Opium** Air-dried milky exudation of unripe capsules. Not less than 9.5 per cent of anhydrous morphine.
Pulvis Opii Dried at 60° C. 10 per cent of anhydrous morphine. Diluent-rice starch or milk sugar.	**Powdered Opium** Dried at not over 70° C. 10.25 per cent of anhydrous morphine. Inert diluent.
Pulvis opii et ipecacuanhæ compositus 10 per cent of powdered opium and 10 per cent of powdered Ipecacuanha.	Not official in the U. S. P. XIII.
Tinctura opii 1 per cent of anhydrous morphine. Menstruum, 70 per cent alcohol.	**Opium Tincture** 100 cc. yields 1 Gm. of anhydrous morphine. Menstruum, water.
Tinctura opii crocata seu Laudanum Sydenhami 1 per cent of anhydrous morphine.	Not official in the U. S. P. XIII.
Tinctura opii benzoica 0.05 per cent of anhydrous morphine.	**Camphorated Opium Tincture** 100 cc. yields 0.04 Gm. of anhydrous morphine.
Extractum opii aquosum 20 per cent of anhydrous morphine.	Not official in the U. S. P. XIII.
Sirupus opii 0.05 per cent of anhydrous morphine.	Not official in the U. S. P. XIII.
Sirupus opii dilutus seu sirupus diacodii 0.01 per cent of anhydrous morphine.	Not official in the U. S. P. XIII.

ARTICLES ADDED TO THE U. S. PHARMACOPŒIA, THIRTEENTH

English Title	Latin Title
Aluminum Phosphate Gel	Gelatum Alumini Phosphatis
Aminopyrine Tablets	Tabellæ Aminopyrinæ
Anhydrohydroxyprogesterone	Anhydrohydroxyprogesteronum
Anhydrohydroxyprogesterone Tablets	Tabellæ Anhydrohydroxyprogesteroni
Anticoagulant Acid Citrate Dextrose Solution	Liquor Acidi Citratis Dextrosi Anticoagulans
Antimony Sodium Thioglycollate	Antimonii Sodii Thioglycollas
Antimony Sodium Thioglycollate Injection	Injectio Antimonii Sodii Thioglycollatis
Apomorphine Hydrochloride Tablets	Tabellæ Apomorphinæ Hydrochloridi
Bentonite Magma	Magma Bentoniti
Benzyl Benzoate	Benzylis Benzoas
Benzyl Benzoate Lotion	Lotio Benzylis Benzoatis
Benzyl Benzoate, Saponated	Benzylis Benzoas Saponatus
Benzalkonium Chloride	Benzalkonii Chloridum
Benzalkonium Chloride Solution	Liquor Benzalkonii Chloridi
Calamine	Calamina
Calamine Lotion	Lotio Calaminæ
Calcium Phosphate, Dibasic	Calcii Phosphas Dibasicus
Carbachol	Carbacholum
Carbachol Injection	Injectio Carbacholi
Carbachol Tablets	Tabellæ Carbacholi
Cholera Vaccine	Vaccinum Choleræ
Cholesterol	Cholesterol
Coal Tar	Pix Carbonis
Coal Tar Ointment	Unguentum Picis Carbonis
Corn Oil	Oleum Maydis
Cupric Citrate	Cupri Citras
Cupric Citrate Ointment	Unguentum Cupri Citratis
Desoxycorticosterone Acetate	Desoxycorticosteroni Acetas
Digitoxin	Digitoxinum
Digitoxin Injection	Injectio Digitoxini
Digitoxin Tablets	Tabellæ Digitoxini
Digoxin	Digoxinum
Digoxin Injection	Injectio Digoxini
Digoxin Tablets	Tabellæ Digoxini
Diphtheria and Tetanus Toxoids	Toxoida Diphtherica et Tetanica
Diphtheria and Tetanus Toxoids, Alum Precipitated	Toxoida Diphtherica et Tetanica Alumen-præcipitata
Ethylenediamine Solution	Liquor Æthylenediaminæ
Gas Gangrene Antitoxin, Bivalent	Antitoxinum Gas-gangrænosum Bivalens

English Title	Latin Title
Gas Gangrene Antitoxin, Pentavalent	Antitoxinum Gas-gangrænosum Pentavalens
Gas Gangrene Antitoxin, Trivalent	Antitoxinum Gas-gangrænosum Trivalens
Helium	Helium
Hexylresorcinol Pills	Pilulæ Hexylresorcinolis
Hydrophilic Ointment	Unguentum Hydrophilicum
Hydrophilic Petrolatum	Petrolatum Hydrophilicum
Protamine Zinc Insulin Injection	Injectio Zinco-Insulini Protaminati
Iodopyracet Injection ..	Injectio Iodopyraceti
Lanatoside C	Lanatosidum C
Lanatoside C Injection	Injectio Lanatosidi C
Lanatoside C Tablets	Tabellæ Lanatosidi C
Liver with Stomach	Hepar cum Stomacho
Methacholine Chloride	Methacholinæ Chloridum
Methacholine Chloride Capsules	Capsulæ Methacholinæ Chloridi
Methacholine Chloride Injection	Injectio Methacholinæ Chloridi
Methylparaben	Methylparabenum
Methyltestosterone	Methyltestosteronum
Methyltestosterone Tablets	Tabellæ Methyltestosteroni
Morphine Injection	Injectio Morphinæ
Nicotinamide Injection	Injectio Nicotinamidi
Papaverine Hydrochloride	Papaverinæ Hydrochloridum
Papaverine Hydrochloride Injection	Injectio Papaverinæ Hydrochloridi
Peanut Oil	Oleum Arachidis
Penicillin Calcium	Penicillinum Calcicum
Penicillin Sodium	Penicillinum Sodicum
Penicillin Dental Cones	Denticoni Penicillini
Pencillin Injection in Oil and Wax	Injectio Penicillini in Oleo et Cera
Penicillin Ointment	Unguentum Penicillini
Penicillin Tablets	Tabellæ Penicillini
Penicillin Troches	Trochisci Penicillini
Plague Vaccine	Vaccinum Pestis
Progesterone	Progesteronum
Propylparaben	Propylparabenum
Riboflavin Injection	Injectio Riboflavini
Ringer's Solution, Lactated	Liquor Ringeri Lacticus
Sesame Oil	Oleum Sesami
Sodium Ascorbate Injection	Injectio Sodii Ascorbatis
Sodium Lactate Injection	Injectio Sodii Lactatis
Sodium Lauryl Sulfate	Sodii Lauryl Sulfas
Sodium Morrhuate Injection	Injectio Sodii Morrhuatis
Stearyl Alcohol	Alcohol Stearylicum
Sulfamerazine	Sulfamerazinum
Sulfamerazine Tablets	Tabellæ Sulfamerazini
Sulfamerazine Sodium	. .Sulfamerazinum Sodicum
Sulfamerazine Sodium, Sterile	.....Sulfamerazinum Sodicum Sterile

English Title	Latin Title
Suramin Sodium	Suraminum Sodicum
Surgical Sutures	Chordæ Chirurgicales
Testosterone Propionate	Testosteroni Propionas
Tetanus and Gas Gangrene Antitoxins	Antitoxina Tetanica et Gas-gangrænosa
Thiamine Hydrochloride Injection	Injectio Thiaminæ Hydrochloridi
Thiopental Sodium	Thiopentalum Sodicum
Thiopental Sodium, Sterile	Thiopentalum Sodicum Sterile
Triethanolamine	Triæthanolamina
Tuberculin, Purified Protein Derivative of	Tuberculini Derivativum Proteinicum Purificatum
Typhus Vaccine, Epidemic	Vaccinum Typhusum Epidemicum
Vinyl Ether	Æther Vinylicus
Yellow Fever Vaccine	Vaccinum Febris Flavæ

ARTICLES OFFICIAL IN THE U. S. P. XII AND THE FIRST BOUND SUPPLEMENT TO THE U. S. P. XII BUT NOT ADMITTED TO THE U. S. P. XIII

Acetonum
Acidum Aceticum
Acidum Aminoaceticum
Acidum Lacticum
Acidum Mandelicum
Acidum Nitricum
Acidum Phosphoricum
Acidum Phosphoricum Dilutum
Acidum Sulfuricum
Acidum Sulfuricum Dilutum
Æthylis Chaulmoogras
Alcohol Dehydratum
Allylis Isothiocyanas
Althæa
Antipyrina
Aqua Chloroformi
Argentum Proteinicum Forte
Belladonnæ Radix
Bismuthi Subnitras
Calcii Phosphas Tribasicus
Capsulæ Carbonei Tetrachloridi
Capsulæ Olei Chenopodii
Capsulæ Triasyni B cum Hepati
Carbonei Tetrachloridum
Ceratum
Ceratum Resinæ
Chloramina-T
Codeina
Colchici Semen
Concentratum B-Vitaminarum Hepatis
Decocta
Emplastrum Belladonnæ
Emulsum Olei Terebinthinæ
Ergota
Eriodictyon
Eucainæ Hydrochloridum
Extractum Hyoscyami
Extractum Malti
Extractum Rhei
Fel Bovis
Ferri et Ammonii Citrates Virides
Ferrum Reductum
Fluidextractum Ergotæ
Fluidextractum Eriodictyi
Hydrargyri Bichloridum
Hydrargyri Salicylas
Hydrargyri Succinimidum
Hydrargyrum cum Creta
Infusa
Injectio B-Vitaminarum Hepatis
Injectio Hydrargyri Salicylatis
Injectio Strophanthini
Injectio Triasyni B cum Hepati
Linum
Liquor Acidi Arseniosi
Liquor Hydrogenii Peroxidi Fortior
Liquor Iodi
Lycopodium
Magnesii Phosphas Tribasicus
Massa Ferri Carbonatis
Mel
Nux Vomica
Oleum Amygdalæ Amaræ
Oleum Chaulmoogræ
Oleum Chenopodii
Oleum Juniperi
Oleum Lini
Oleum Picis Rectificatum
Oleum Pini Pumilionis
Oleum Terebinthinæ
Oleum Terebinthinæ Rectificatum
Pamaquinæ Naphthoas
Pelletierinæ Tannas
Phenylis Salicylas
Pilulæ Ferri Carbonatis
Potassa Sulfurata
Potassii Bitartras
Potassii Nitras
Pulvis Cretæ Compositus
Quininæ Æthylcarbonas
Quininæ et Ureæ Hydrochloridum
Resina
Serum Antimeningococcicum
Serum Antipneumococcicum

Serum Immune Morbillosi Humanum
Serum Immune Scarlatinæ Humanum
Sevum Præparatum
Sodii Cacodylas
Spiritus Anisi
Spiritus Camphoræ
Spiritus Frumenti
Spiritus Glycerylis Trinitratis
Spiritus Vini Vitis
Strophanthinum
Sulfapyridinum
Sulfapyridinum Sodicum Sterile
Syrupus Picis Pini
Tabellæ Magnesii Phosphatis Tribasici
Tabellæ Sulfapyridini
Terpini Hydras
Thymolis Iodidum
Tinctura Colchici Seminis
Tinctura Iodi (7 per cent)*
Tinctura Nucis Vomicæ
Toxitabellæ Hydrargyri Bichloridi Magnæ
Toxitabellæ Hydrargyri Bichloridi Parvæ
Trinitrophenol
Unguentum Iodi
Zinci Acetas
Zinci Chloridum

* The title "Iodine Tincture" is retained in the U. S. P. XIII but it now applies to Mild Iodine Tincture (2 per cent) of the U. S. P. XII.

CHANGES IN OFFICIAL ENGLISH TITLES

U. S. P. XII	U. S. P. XIII
Antimony and Potassium Tartrate	Antimony Potassium Tartrate
Bacterial Vaccine made from the Typhoid Bacillus	Typhoid Vaccine
Bacterial Vaccine made from the Typhoid Bacillus and the Paratyphoid "A" and "B" Bacilli	Typhoid and Paratyphoid Vaccine
Bismuth and Potassium Tartrate	Bismuth Potassium Tartrate
Bismuth and Potassium Tartrate Injection	Bismuth Potassium Tartrate Injection
Cascara Sagrada Tablets	Cascara Sagrada Extract Tablets
Diphtheria Toxin for the Schick Test	Diagnostic Diphtheria Toxin
Epinephrine Hydrochloride Injection	Epinephrine Injection
Epinephrine Hydrochloride Spray	Epinephrine Inhalation
Ethyl Carbamate	Urethane
Iron and Ammonium Citrates	Ferric Ammonium Citrate
Iron and Ammonium Citrates Capsules	Ferric Ammonium Citrate Capsules
Isotonic Solution of Three Chlorides	Ringer's Solution
Methylthionine Chloride	Methylene Blue
Mild Protein Silver	Mild Silver Protein
Potassium and Sodium Tartrate	Potassium Sodium Tartrate
Purified Benzin	Petroleum Benzin
Purified Talc	Talc
Quinine Hydrochloride and Ethyl Carbamate Injection	Quinine and Urethane Injection
Solution of Epinephrine Hydrochloride	Epinephrine Solution
Sterilized Distilled Water	Sterile Distilled Water
Theophylline Ethylenediamine	Aminophylline
Theophylline Ethylenediamine Injection	Aminophylline Injection
Theophylline Ethylenediamine Tablets	Aminophylline Tablets

NOTE—In addition to the changes in English titles listed above numerous titles have been altered by omitting "of" and transposing the class and specific names. The change from Tincture of Belladonna to Belladonna Tincture is an example. See General Notices, page 4.

CHANGES IN OFFICIAL LATIN TITLES

U. S. P. XII	U. S. P. XIII
Æthylis Carbamas.......	Urethanum
Antimonii et Potassii Tartras	Antimonii Potassii Tartras
Aqua Destillata Sterilisata	Aqua Destillata Sterilis
Benzinum Purificatum	Benzinum Petrolei
Bismuthi et Potassii Tartras	Bismuthi Potassii Tartras
Capsulæ Ferri et Ammonii Citratum	Capsulæ Ferri Ammonii Citratis
Ferri et Ammonii Citrates	Ferri Ammonii Citras
Injectio Bismuthi et Potassii Tartratis	Injectio Bismuthi Potassii Tartratis
Injectio Epinephrinæ Hydrochloridi	Injectio Epinephrinæ
Injectio Quininæ Hydrochloridi et Æthylis Carbamatis	Injectio Quininæ et Urethani
Injectio Theophyllinæ Æthylenediaminicæ .	Injectio Aminophyllinæ
Liquor Chloridorum Trium Isotonicus	Liquor Ringeri
Liquor Epinephrinæ Hydrochloridi	Liquor Epinephrinæ
Methylthioninæ Chloridum	Cœruleum Methylenum
Nebula Epinephrinæ Hydrochloridi	Inhalatio Epinephrinæ
Potassii et Sodii Tartras	Potassii Sodii Tartras
Tabellæ Cascaræ Sagradæ	Tabellæ Cascaræ Sagradæ Extracti
Tabellæ Theophyllinæ Æthylenediaminicæ	Tabellæ Aminophyllinæ
Talcum Purificatum	Talcum
Theophyllina Æthylenediaminica	Aminophyllina
Vaccinum Typho-Paratyphosum	Vaccinum Typhosum et Paratyphosum

PHARMACOPŒIAL SUBSTANCES, THEIR PREPARATIONS AND PRODUCTS, WITH ENGLISH AND SPANISH TITLES

A

English Title	Spanish Title
Acacia	Acacia (Goma Arábiga)
Acacia Mucilage	Mucílago de Goma Arábiga
Acetanilid	Acetanilida
Acetophenetidin	Acetofenetidina
Acetophenetidin Tablets	Tabletas de Acetofenetidina
Acid, Acetic, Glacial	Acido Acético Glacial
Acid, Acetylsalicylic	Acido Acetilsalicílico
Acetylsalicylic Acid Tablets	Tabletas de Acido Acetilsalicílico
Acid, Ascorbic	Acido Ascórbico
Ascorbic Acid Tablets	Tabletas de Acido Ascórbico
Sodium Ascorbate Injection	Inyección de Ascorbato Sódico
Acid, Benzoic	Acido Benzoico
Camphorated Opium Tincture	Tintura de Opio Alcanforada
Acid, Boric	Acido Bórico
Boric Acid Ointment	Unguento de Acido Bórico
Boroglycerin Glycerite	Glicerito de Boroglicerina
Acid, Citric	Acido Cítrico
Citric Acid Syrup	Jarabe de Acido Cítrico
Acid, Hydriodic, Diluted	Acido Yodhídrico Diluído
Hydriodic Acid Syrup	Jarabe de Acido Yodhídrico
Acid, Hydrochloric	Acido Clorhídrico
Diluted Hydrochloric Acid	Acido Clorhídrico Diluido
Acid, Hypophosphorous	Acido Hipofosforoso (31%)
Acid, Nicotinic	Acido Nicotínico
Nicotinic Acid Tablets	Tabletas de Acido Nicotínico
Acid, Oleic	Acido Oleico
Acid, Salicylic	Acido Salicílico
Acid, Stearic	Acido Esteárico
Acid, Tannic	Acido Tánico
Tannic Acid Glycerite	Glicerito de Acido Tánico
Tannic Acid Ointment	Unguento de Acido Tánico
Acid, Tartaric	Acido Tartárico
Acid, Trichloroacetic	Acido Tricloroacético
Agar	Agar
Alcohol	Alcohol
Diluted Alcohol	Alcohol Diluído
Aloe	Aloe
Aloin	Aloína
Alum	Alumbre
Exsiccated Alum	Alumbre Desecado
Aluminum Hydroxide Gel	Hidrato de Aluminio Gelatinado
Aluminum Hydroxide Gel, Dried	Hidrato de Aluminio Gelatinado Seco
Aluminum Phosphate Gel	Gel de Fosfato de Aluminio
Amaranth	Amaranto
Amaranth Solution	Solución de Amaranto
Aminophylline	Aminofilina
Aminophylline Injection	Inyección de Aminofilina
Aminophylline Tablets	Tabletas de Aminofilina
Aminopyrine	Aminopirina
Aminopyrine Tablets	Tabletas de Aminopirina

English Title	Spanish Title
Ammonia Solution, Strong	Solución de Amoníaco Fuerte
Diluted Ammonia Solution	Solución de Amoníaco Diluída
Aromatic Ammonia Spirit	Espíritu Aromatico de Amoníaco
Ammonium Carbonate	Carbonato de Amonio
Aromatic Ammonia Spirit	Espíritu Aromático de Amoníaco
Ammonium Chloride	Cloruro de Amonio
Ammonium Chloride Capsules	Cápsulas de Cloruro de Amonio
Amyl Nitrite	Nitrito de Amilo
Amylene Hydrate	Hidrato de Amileno
Anhydrohydroxyprogesterone	Anhidrohidroxiprogesterona
Anhydrohydroxyprogesterone Tablets	Tabletas de Anhidrohidroxiprogesterona
Antimony Potassium Tartrate	Tartrato Potásico Antimónico
Antimony Sodium Thioglycollate	Tioglicolato de Sodio y Antimonio
Antimony Sodium Thioglycollate Injection	Inyección de Tioglicolato de Sodio y Antimonio
Antitoxin, Diphtheria	Antitoxina Diftérica
Antitoxin, Gas Gangrene, Bivalent.	Antitoxina de la Gangrena Gaseosa, Bivalente
Antitoxin, Gas Gangrene, Pentavalent	Antitoxina de la Gangrena Gaseosa, Pentavalente
Antitoxin, Gas Gangrene, Trivalent	Antitoxina de la Gangrena Gaseosa, Trivalente
Antitoxin, Scarlet Fever Streptococcus	Antitoxina Escarlatinosa
Antitoxin, Tetanus	Antitoxina Tetánica
Antitoxin, Tetanus and Gas Gangrene	Antitoxina del Tétano y la Gangrena Gaseosa
Apomorphine Hydrochloride	Clorhidrato de Apomorfina
Apomorphine Hydrochloride Tablets	Tabletas de Clorhidrato de Apomorfina
Arsenic Trioxide	Trióxido de Arsénico
Potassium Arsenite Solution	Solución de Arsenito de Potasio
Arsphenamine	Arsfenamina
Aspidium	Aspidio
Aspidium Oleoresin	Oleorresina de Aspidio

B

English Title	Spanish Title
Balsam, Peruvian	Bálsamo Peruviano
Balsam, Tolu	Bálsamo de Tolú
Tolu Balsam Syrup	Jarabe de Bálsamo de Tolú
Tolu Balsam Tincture	Tintura de Bálsamo de Tolú
Compound Benzoin Tincture	Tintura de Benjuí Compuesta
Barbital	Barbital
Barbital Tablets	Tabletas de Barbital
Barbital Sodium	Barbital Sódico
Barbital Sodium Tablets	Tabletas de Barbital Sodico
Barium Sulfate	Sulfato de Bario
Belladonna Leaf	Hoja de Belladona
Atropine	Atropina
Atropine Sulfate	Sulfato de Atropina
Atropine Sulfate Tablets	Tabletas de Sulfato de Atropina
Belladonna Extract	Extracto de Belladona
Belladonna Ointment	Unguento de Belladona
Belladonna Tincture	Tintura de Belladona
Bentonite	Bentonita
Bentonite Magma	Magma de Bentonita
Benzalkonium Chloride	Cloruro de Benzalkonio
Benzalkonium Chloride Solution	Solucion de Cloruro de Benzalkonio

English Title	Spanish Title
Benzin, Petroleum	Bencina de Petróleo
Benzoin	Benjuí
Benzoin Tincture	Tintura de Benjuí
Benzoin Tincture Compound	Tintura de Benjuí Compuesta
Benzyl Benzoate	Benzoato de Bencilo
Benzyl Benzoate Lotion	Loción de Benzoato de Bencilo
Benzyl Benzoate, Saponated	Benzoato de Bencilo, Saponificado
Betanaphthol	Betanaftol
Bismuth Potassium Tartrate	Tartrato Potásico-Bismútico
Bismuth Potassium Tartrate Injection	Inyección de Tartrato Potásico-Bismútico
Bismuth Subcarbonate	Subcarbonato de Bismuto
Bismuth Subsalicylate	Subsalicilato de Bismuto
Bismuth Subsalicylate Injection	Inyección de Subsalicilato de Bismuto
Butacaine Sulfate	Sulfato de Butacaína
Butyl Aminobenzoate	Aminobenzoato de Butilo

C

English Title	Spanish Title
Caffeine	Cafeína
Caffeine, Citrated	Cafeína Citratada
Caffeine and Sodium Benzoate	Cafeína y Benzoato de Sodio
Caffeine and Sodium Benzoate Injection	Inyección de Cafeína y Benzoato de Sodio
Calamine	Calamina
Calamine Lotion	Loción de Calamina
Calcium Carbonate, Precipitated	Carbonato de Calcio Precipitado
Calcium Chloride	Cloruro de Calcio
Ringer's Solution	Solución de Ringer
Ringer's Solution, Lactated	Solución de Ringer, Lactada
Calcium Gluconate	Gluconato de Calcio
Calcium Gluconate Injection	Inyección de Gluconato de Calcio
Calcium Hydroxide	Hidrato de Calcio
Calcium Hydroxide Solution	Solución de Hidrato de Calcio
Calcium Iodobehenate	Yodobehenato de Calcio
Calcium Lactate	Lactato de Calcio
Calcium Mandelate	Mandelato de Calcio
Calcium Phosphate, Dibasic	Fosfato Dibásico de Calcio
Camphor	Alcanfor
Camphor and Soap Liniment	Linimento de Alcanfor y Jabón
Camphor Liniment	Linimento de Alcanfor
Camphor Water	Agua de Alcanfor
Camphorated Opium Tincture	Tintura de Opio Alcanforada
Caraway	Alcaravea
Carbachol	Carbacol
Carbachol Injection	Inyección de Carbacol
Carbachol Tablets	Tabletas de Carbacol
Carbarsone	Carbarsón
Carbon Dioxide	Bióxido de Carbono
Cardamom Seed	Semilla de Cardamomo
Compound Cardamom Tincture	Tintura de Cardamomo Compuesta
Cascara Sagrada	Cáscara Sagrada
Cascara Sagrada Extract	Extracto de Cáscara Sagrada
Cascara Sagrada Extract Tablets	Tabletas de Extracto de Cáscara Sagrada
Cascara Sagrada Fluidextract	Extracto Flúido de Cáscara Sagrada
Cascara Sagrada Fuidextract, Aromatic	Extracto Flúido Aromatico de Cáscara Sagrada

English Title	Spanish Title
Chalk, Prepared	Creta Preparada
Chalk Mixture	Mixtura de Creta
Charcoal, Activated	Carbón Vegetal Activado
Chiniofon	Quiniofón
Chiniofon Tablets	Tabletas de Quiniofón
Chloral Hydrate	Hidrato de Cloral
Chloroazodin	Cloroazodina
Chloroazodin Solution	Solución de Cloroazodina
Chlorobutanol	Clorobutanol
Chloroform	Cloroformo
Chloroform Liniment	Linimento de Cloroformo
Cholesterol	Colesterol
Chromium Trioxide	Trióxido de Cromo
Chrysarobin	Crisarobina
Chrysarobin Ointment	Unguento de Crisarobina
Cinnamon	Canela
Cinnamon Oil	Esencia de Canela
Cinnamon Spirit	Espiritu de Canela
Cinnamon Water	Agua de Canela
Clove	Clavo
Clove Oil	Esencia de Clavo
Cocaine	Cocaína
Cocaine Hydrochloride	Clorhidrato de Cocaína
Cochineal	Cochinilla
Colchicine	Colchicina
Colchicine Tablets	Tabletas de Colchicina
Collodion	Colodion
Flexible Collodion	Colodión Flexible
Corn Oil	Aceite de Maíz
Cotton, Purified	Algodón Purificado
Cresol	Cresol
Saponated Cresol Solution	Solución de Cresol Saponificada
Cupric Citrate	Citrato Cúprico
Cupric Citrate Ointment	Unguento de Citrato Cúprico
Cupric Sulfate	Sulfato Cúprico
Cyclopropane	Ciclopropano
	D
Desoxycorticosterone Acetate	Acetato de Desoxicorticosterona
Dextrose	Dextrosa
Dextrose Injection	Inyección de Dextrosa
Dextrose and Sodium Chloride Injection	Inyeccion de Dextrosa y Cloruro de Sodio
Dichlorophenarsine Hydrochloride	Clorhidrato de Dichlorofenarsina
Diethylstilbestrol	Dietilestilbestrol
Diethylstilbestrol Capsules	Cápsulas de Dietilestilbestrol
Diethylstilbestrol Injection	Inyeccion de Dietilestilbestrol
Diethylstilbestrol Tablets	Tabletas de Dietilestilbestrol
Digitalis	Digital
Digitalis Capsules	Cápsulas de Digital
Digitalis Injection	Inyección de Digital
Digitalis, Powdered	Digital Pulverizada
Digitalis Tablets	Tabletas de Digital
Digitalis Tincture	Tintura de Digital
Digitoxin	Digitoxina
Digitoxin Injection	Inyección de Digitoxina
Digitoxin Tablets	Tabletas de Digitoxina

English Title	Spanish Title
Digoxin	Digoxina
Digoxin Injection	Inyección de Digoxina
Digoxin Tablets	Tabletas de Digoxina
Diphenylhydantoin Sodium	Difenilhidantoína Sódica
Diphenylhydantoin Sodium Capsules	Cápsulas de Difenilhidantoína Sódica
	E
Elixir, Aromatic	Elixir Aromático
Emetine Hydrochloride	Clorhidrato de Emetina
Emetine Hydrochloride Injection	Inyección de Clorhidrato de Emetina
Ephedrine	Efedrina
Ephedrine Hydrochloride	Clorhidrato de Efedrina
Ephedrine Sulfate	Sulfato de Efedrina
Ephedrine Sulfate Tablets	Tabletas de Sulfato de Efedrina
Epinephrine	Epinefrina
Epinephrine Inhalation	Inhalación de Epinefrina
Epinephrine Injection	Inyección de Epinefrina
Epinephine Solution	Solución de Epinefrina
Ergonovine Maleate	Maleato de Ergonovina
Ergonovine Maleate Injection	Inyección de Maleato de Ergonovina
Ergonovine Maleate Tablets	Tabletas de Maleato de Ergonovina
Ergotamine Tartrate	Tartrato de Ergotamina
Ergotamine Tartrate Tablets	Tabletas de Tartrato de Ergotamina
Erythrityl Tetranitrate Tablets	Tabletas de Tetranitrato de Eritritilo
Estradiol	Estradiol
Estradiol Benzoate	Benzoato de Estradiol
Estrone	Estrona
Ether	Eter
Ethyl Aminobenzoate	Aminobenzoato de Etilo
Ethyl Aminobenzoate Ointment	Unguento de Aminobenzoato de Etilo
Ethyl Chloride	Cloruro de Etilo
Ethyl Oxide	Oxido de Etilo
Ethylene	Etileno
Ethylenediamine Solution	Solución de Etilenediamina
Eucalyptol	Eucaliptol
Eucatropine Hydrochloride	Clorhidrato de Eucatropina
Eugenol	Eugenol
	F
Ferric Ammonium Citrate	Citrato de Amonio Férrico
Ferric Ammonium Citrate Capsules	Cápsulas de Citrato de Amonio Férrico
Ferrous Sulfate	Sulfato Ferroso
Exsiccated Ferrous Sulfate	Sulfato Ferroso Desecado
Ferrous Sulfate Tablets	Tabletas de Sulfato Ferroso
Fluorescein Sodium	Fluoresceína Sódica
Formaldehyde Solution	Solución de Formaldehido
	G
Gauze, Absorbent	Gasa Absorbente
Gauze, Absorbent, Adhesive	Gasa Absorbente Adhesiva
Gauze, Absorbent, Sterile	Gasa Absorbente Estéril
Gauze Bandage	Venda de Gasa Absorbente
Gelatin	Gelatina
Glycerinated Gelatin	Gelatina Glicerinada
Gentian	Genciana
Compound Gentian Tincture.	Tintura de Genciana Compuesta

English Title	Spanish Title
Ginger	Jengibre
Ginger Fluidextract	Extracto Flúido de Jengibre
Globulin, Human Immune	Globulina Inmune Humana
Glucose, Liquid	Glucosa Líquida
Glycerin	Glicerina
Glycerin Suppositories	Supositorios de Glicerina
Glyceryl Triacetate	Triacetato de Glicerilo
Glyceryl Trinitrate Tablets	Tabletas de Trinitrato de Glicerilo
Glycyrrhiza	Regaliz
Glycyrrhiza Extract	Extracto de Regaliz
Glycyrrhiza Extract, Pure	Extracto de Regaliz Puro
Glycyrrhiza Fluidextract	Extracto Flúido de Regaliz
Glycyrrhiza Syrup	Jarabe de Regaliz
	H
Helium	Helio
Hexavitamin Capsules	Capsulas de Hexavitamina
Hexavitamin Tablets	Tabletas de Hexavitamina
Hexylresorcinol	Hexilresorcinol
Hexylresorcinol Pills	Pildoras de Hexilresorcinol
Histamine Phosphate	Fosfato de Histamina
Histamine Phosphate Injection	Inyección de Fosfato de Histamina
Homatropine Hydrobromide	Bromhidrato de Homatropina
Hydrogen Peroxide Solution	Solución de Peróxido de Hidrógeno
Hyoscyamus	Beleño
Hyoscyamus Tincture	Tintura de Beleño
	I
Insulin Injection	Inyección de Insulina
Protamine Zinc Insulin Injection	Inyección de Insulina y Protamina en Zinc
Iodine	Yodo
Iodine Tincture	Tintura de Yodo
Strong Iodine Solution	Solución de Yodo Fuerte
Iodophthalein Sodium	Yodoftaleína Sódica
Iodopyracet Injection	Inyección de Yodapiracet
Ipecac	Ipecacuana
Ipecac Fluidextract	Extracto Flúido de Ipecacuana
Ipecac Syrup	Jarabe de Ipecacuana
	J
Juniper Tar	Brea de Enebro
	L
Lactose	Lactosa
Lanatoside C	Lanatosida C
Lanatoside C Injection	Inyección de Lanatosida C
Lanatoside C Tablets	Tabletas de Lanatosida C
Lard	Manteca
Benzoinated Lard	Manteca Benzoinada
Lead Acetate	Acetato de Plomo
Lemon Peel	Corteza de Limón
Lemon Oil	Esencia de Limón
Lemon Tincture	Tintura de Limón
Citric Acid Syrup	Jarabe de Acido Cítrico

English Title	Spanish Title
Liver Extract	Extracto de Hígado
Liver Injection	Inyección de Hígado
Liver Solution	Solución de Hígado
Liver with Stomach	*Hígado con Estómago*

M

English Title	Spanish Title
Magnesia Magma	Magma de Magnesia
Magnesium Carbonate	Carbonato de Magnesio
Magnesium Citrate Solution	Solución de Citrato de Magnesio
Magnesium Oxide	Oxido de Magnesio
Magnesium Oxide, Heavy	Oxido de Magnesio Pesado
Magnesium Sulfate	Sulfato de Magnesio
Magnesium Trisilicate	Trisilicato de Magnesio
Magnesium Trisilicate Tablets	Tabletas de Trisilicato de Magnesio
Menadione	Menadiona
Menadione Tablets	Tabletas de Menadiona
Menadione Sodium Bisulfite	Bisulfito de Menadiona Sódica
Menadione Sodium Bisulfite Injection	Inyección de Bisulfitomenadiona Sódica
Menthol	Mentol
Mercuric Oxide, Yellow	Oxido Mercúrico Amarillo
Yellow Mercuric Oxide Ointment	Ungüento de Oxido Mercúrico Amarillo
Mercurophylline Injection	Inyección de Mercurofilina
Mercurous Chloride, Mild	Cloruro Mercurioso Mitigado
Mercury	Mercurio
Mild Mercurial Ointment	Ungüento Mercurial Mitigado
Strong Mercurial Ointment	Ungüento Mercurial Fuerte
Mercury, Ammoniated	Mercurio Amoniacal
Ammoniated Mercury Ointment	Ungüento de Mercurio Amoniacal
Mercury Oleate	Oleato de Mercurio
Mersalyl	Mersalil
Mersalyl and Theophylline Injection	Inyección de Mersalil y Teofilina
Methacholine Chloride	Cloruro de Metacolina
Methacholine Chloride Capsules	Cápsulas de Cloruro de Metacolina
Methacholine Chloride Injection	Inyección de Cloruro de Metacolina
Methenamine	Metenamina
Methenamine Tablets	Tabletas de Metenamina
Methyl Salicylate	Salicilato de Metilo
Methylene Blue	Azul de Metileno
Methylparaben	Metilparabeno
Methyltestosterone	Metiltestosterona
Methyltestosterone Tablets	Tabletas de Metiltestosterona
Mustard, Black	Mostaza Negra
Mustard Plaster	Emplasto de Mostaza
Myristica	Nuez Moscada
Myristica Oil	Esencia de Nuez Moscada
Myrrh	Mirra
Myrrh Tincture	Tintura de Mirra

N

English Title	Spanish Title
Neoarsphenamine	Neoarsfenamina
Neocinchophen	Neocincofeno
Neocinchophen Tablets	Tabletas de Neocincofeno
Neostigmine Bromide	Bromuro de Neostigmina
Neostigmine Bromide Tablets	Tabletas de Bromuro de Neostigmina
Neostigmine Methylsulfate	Metilsulfato de Neostigmina
Neostigmine Methylsulfate Injection	Inyección de Metilsulfato de Neostigmina

English Title	Spanish Title
Nicotinamide	Nicotinamida
Nicotinamide Injection	Inyección de Nicotinamida
Nicotinamide Tablets	*Tabletas de Nicotinamida*
Nitrous Oxide	Oxido Nitroso

O

English Title	Spanish Title
Oil, Almond, Expressed	Aceite de Almendra por Expresión
Oil, Anise	Esencia de Anís
Anise Water	Agua de Anís
Oil, Castor	Aceite de Ricino
Oil, Cedar Leaf	Esencia de Hoja de Cedro
Oil, Cod Liver	Aceite de Hígado de Bacalao
Cod Liver Oil Emulsion	Emulsión de Aceite de Hígado de Bacalao
Oil, Cod Liver, Non-destearinated	Aceite de Hígado de Bacalao no Desestearinizado
Oil, Coriander	Esencia de Cilantro
Oil, Cottonseed	Aceite de Semilla de Algodón
Oil, Eucalyptus	Esencia de Eucalipto
Oil, Fennel	Esencia de Hinojo
Fennel Water	Agua de Hinojo
Oil, Halibut Liver	Aceite de Hipogloso
Halibut Liver Oil Capsules	Cápsulas de Aceite de Hipogloso
Oil, Iodized	Aceite Yodado
Oil, Lavender	Esencia de Espliego
Compound Lavender Tincture	Tintura de Espliego Compuesta
Lavender Spirit	Espíritu de Espliego
Oil, Olive	Aceite de Oliva
Oil, Persic	Aceite Pérsico
Oil, Rose	Esencia de Rosa
Rose Water	Agua de Rosa
Rose Water Ointment	Ungüento de Agua de Rosa
Stronger Rose Water	Agua de Rosa Concentrada
Oil, Rosemary	Esencia de Romero
Oil, Sassafras	Esencia de Sasafrás
Oil, Sesame	Aceite de Sésamo
Oil, Theobroma	Aceite de Teobroma
Ointment, Hydrophilic	Ungüento Hidrófilo
Ointment, White	Ungüento Blanco
Ointment, Yellow	Ungüento Amarillo
Oleovitamin A	Oleovitamina A
Oleovitamin A Capsules	Cápsulas de Oleovitamina A
Oleovitamin A and D	Oleovitaminas A y D
Oleovitamin A and D, Concentrated	Oleovitaminas A y D Concentradas
Concentrated Oleovitamin A and D Capsules	Cápsulas de Oleovitaminas A y D Concentradas
Oleovitamin D, Synthetic	Oleovitamina D Sintética
Opium	Opio
Apomorphine Hydrochloride	Clorhidrato de Apomorfina
Codeine Phosphate	Fosfato de Codeína
Codeine Phosphate Tablets	Tabletas de Fosfato de Codeína
Codeine Sulfate	Sulfato de Codeína
Codeine Sulfate Tablets	Tabletas de Sulfato de Codeína
Dihydromorphinone Hydrochloride	Clorhidrato de Dihidromorfinona
Dihydromorphinone Hydrochloride Tablets	Tabletas de Clorhidrato de Dihidromorfinona
Ethylmorphine Hydrochloride	Clorhidrato de Etilmorfina
Granulated Opium	Opio Granulado

English Title	Spanish Title
Morphine Injection	Inyección de Morfina
Morphine Sulfate	Sulfato de Morfina
Morphine Sulfate Tablets	Tabletas de Sulfato de Morfina
Opium Tincture	Tintura de Opio
Opium Tincture, Camphorated	Tintura de Opio Alcanforada
Powdered Opium	Opio Pulverizado
Orange Flower Water	Agua de Azahar
Orange Flower Syrup	Jarabe de Azahar
Orange Peel, Bitter	Corteza de Naranja Amarga
Compound Gentian Tincture	Tintura de Genciana Compuesta
Orange Peel, Bitter, Tincture	Tintura de Corteza de Naranja Amarga
Orange Peel, Sweet	Corteza de Naranja Dulce
Orange Peel, Sweet, Tincture	Tintura de Corteza de Naranja Dulce
Orange Oil	Esencia de Naranja
Orange Syrup	Jarabe de Naranja
Orange Spirit, Compound	Espíritu de Naranja Compuesto
Ouabain	Ouabaína
Ouabain Injection	Inyección de Ouabaína
Ox Bile Extract	Extracto de Bilis de Buey
Ox Bile Extract Tablets	Tabletas de Extracto de Bilis de Buey
Oxophenarsine Hydrochloride	Clorhidrato de Oxofenarsina
Oxygen	Oxígeno

P

English Title	Spanish Title
Pancreatin	Pancreatina
Papaverine Hydrochloride	Clorhidrato de Papaverina
Papaverine Hydrochloride Injection	Inyección de Clorhidrato de Papaverina
Paraldehyde	Paraldehido
Parathyroid Injection	Inyección de Paratiroides
Peanut Oil	Aceite de Cacahuete
Penicillin Calcium	Penicilina Cálcica
Penicillin Sodium	Penicilina Sódica
Penicillin Dental Cones	Conos Dentales de Penicilina
Penicillin Injection in Oil and Wax	Inyección de Penicilina en Aceite y Cera
Penicillin Ointment	Ungüento de Penicilina
Penicillin Tablets	Tabletas de Penicilina
Penicillin Troches	Trociscos de Penicilina
Pentobarbital Sodium	Pentobarbital Sódico
Pentobarbital Sodium Capsules	Cápsulas de Pentobarbital Sódico
Pentobarbital Sodium Tablets	Tabletas de Pentobarbital Sódico
Peppermint	Menta Piperita
Peppermint Oil	Esencia de Menta Piperita
Peppermint Spirit	Espíritu de Menta Piperita
Peppermint Water	Agua de Menta Piperita
Petrolatum	Petrolato
Petrolatum, Hydrophilic	Petrolato Hidrófilo
Petrolatum, Liquid	Petrolato Líquido
Petrolatum, Liquid, Emulsion	Emulsión de Petrolato Líquido
Petrolatum, Liquid, Light	Petrolato Líquido Liviano
Petrolatum, White	Petrolato Blanco
Phenacaine Hydrochloride	Clorhidrato de Fenacaína
Phenobarbital	Fenobarbital
Phenobarbital Elixir	Elixir de Fenobarbital
Phenobarbital Tablets	Tabletas de Fenobarbital
Phenobarbital Sodium	Fenobarbital Sódico
Phenobarbital Sodium Tablets	Tabletas de Fenobarbital Sódico

English Title	Spanish Title
Phenol	Fenol
Liquefied Phenol	Fenol Licuado
Phenol Ointment	Ungüento de Fenol
Phenolphthalein	Fenolftaleína
Phenolsulfonphthalein	Fenolsulfonftaleína
Phenolsulfonphthalein Injection	Inyección de Fenolsulfonftaleína
Physostigmine Salicylate	Salicilato de Fisostigmina
Picrotoxin	Picrotoxina
Picrotoxin Injection	Inyección de Picrotoxina
Pilocarpine Nitrate	Nitrato de Pilocarpina
Pine Tar	Brea de Pino
Pine Tar Ointment	Ungüento de Brea de Pino
Pituitary, Posterior	Pituitaria Posterior
Posterior Pituitary Injection	Inyección de Pituitaria Posterior
Plasma, Citrated Normal Human	Plasma Humano Normal Citratado
Plaster, Adhesive	Emplasto Adhesivo
Plaster, Adhesive, Sterile	Emplasto Adhesivo Estéril
Potassium Acetate	Acetato de Potasio
Potassium Bicarbonate	Bicarbonato de Potasio
Potassium Bromide	Bromuro de Potasio
Potassium Carbonate	Carbonato de Potasio
Potassium Chloride	Cloruro de Potasio
Potassium Chloride Tablets	Tabletas de Cloruro de Potasio
Ringer's Solution	Solución de Ringer
Ringer's Solution, Lactated	Solución de Ringer, Lactada
Potassium Citrate	Citrato de Potasio
Effervescent Potassium Citrate	Citrato de Potasio Efervescente
Potassium Hydroxide	Hidrato de Potasio
Potassium Iodide	Yoduro de Potasio
Potassium Permanganate	Permanganato de Potasio
Potassium Sodium Tartrate	Tartrato Sódico-Potásico
Compound Effervescent Powders	Polvos Efervescentes Compuestos
Procaine Hydrochloride	Clorhidrato de Procaína
Progesterone	Progesterona
Propylparaben	Propilparabeno
Pyroxylin	Piroxilina

Q

English Title	Spanish Title
Quinacrine Hydrochloride	Clorhidrato de Quinacrina
Quinacrine Hydrochloride Tablets	Tabletas de Clorhidrato de Quinacrina
Quinidine Sulfate	Sulfato de Quinidina
Quinidine Sulfate Tablets	Tabletas de Sulfato de Quinidina
Quinine Bisulfate	Bisulfato de Quinina
Quinine Dihydrochloride	Biclorhidrato de Quinina
Quinine Hydrochloride	Clorhidrato de Quinina
Quinine and Urethane Injection	Inyección de Quinina y Uretano
Quinine Sulfate	Sulfato de Quinina
Quinine Sulfate Tablets	Tabletas de Sulfato de Quinina

R

English Title	Spanish Title
Red Saunders	Sándalo Rojo
Resorcinol	Resorcinol
Rhubarb	Ruibarbo
Aromatic Rhubarb Syrup	Jarabe de Ruibarbo Aromático
Aromatic Rhubarb Tincture	Tintura de Ruibarbo Aromática

English Title	Spanish Title
Riboflavin	Riboflavina
Riboflavin Injection	Inyección de Riboflavina
Riboflavin Tablets	Tabletas de Riboflavina
Rice Polishings	Salvado (Raspaduras) de Arroz
Rice Polishings Extract	Extracto de Salvado (Raspaduras) de Arroz (Tikitiki)

S

English Title	Spanish Title
Saccharin	Sacarina
Saccharin Sodium	Sacarina Sódica
Saccharin Sodium Tablets	Tabletas de Sacarina Sódica
Sarsaparilla	Zarzaparrilla
Sarsaparilla Fluidextract	Extracto Flúido de Zarzaparrilla
Sarsaparilla Syrup, Compound	Jarabe de Zarzaparrilla Compuesto
Scopolamine Hydrobromide	Bromhidrato de Escopolamina
Senna	Sen
Senna Fluidextract	Extracto Flúido de Sen
Senna Syrup	Jarabe de Sen
Serum, Normal Human	Suero Humano Normal
Siliceous Earth, Purified	Tierra Silícea Purificada
Silver Nitrate	Nitrato de Plata
Toughened Silver Nitrate	Nitrato de Plata Endurecido
Silver Protein, Mild	Proteinato de Plata Mitigado
Soap, Hard	Jabón Duro
Camphor and Soap Liniment	Linimento de Alcanfor y Jabón
Chloroform Liniment	Linimento de Cloroformo
Soap, Soft, Medicinal	Jabón Blando Medicinal
Soft Soap Liniment	Linimento de Jabón Blando
Soda Lime	Cal Sódica
Sodium Benzoate	Benzoato de Sodio
Sodium Bicarbonate	Bicarbonato de Sodio
Sodium Biphosphate	Bifosfato de Sodio
Sodium Borate	Borato de Sodio
Sodium Bromide	Bromuro de Sodio
Sodium Carbonate, Monohydrated	Carbonato de Sodio Monohidratado
Sodium Chloride	Cloruro de Sodio
Dextrose and Sodium Chloride Injection	Inyección de Dextrosa y Cloruro de Sodio
Isotonic Sodium Chloride Solution	Solución Isotónica de Cloruro de Sodio
Ringer's Solution	Solución de Ringer
Ringer's Solution, Lactated	Solución de Ringer, Lactada
Sodium Citrate	Citrato de Sodio
Anticoagulant Sodium Citrate Solution	Solución Anticoagulante de Citrato de Sodio
Anticoagulant Acid Citrate Dextrose Solution	Solución Anticoagulante de Acido Cítrico y Dextrosa
Sodium Hydroxide	Hidrato de Sodio
Sodium Hypochlorite, Solution	Solución de Hipoclorito de Sodio
Sodium Iodide	Yoduro de Sodio
Sodium Lactate Injection	Inyección de Lactato de Sodio
Sodium Lauryl Sulfate	Sulfato Laurílico Sódico
Sodium Morrhuate Injection	Inyección de Morruato Sódico
Sodium Nitrite	Nitrito de Sodio
Sodium Nitrite Tablets	Tabletas de Nitrito de Sodio
Sodium Perborate	Perborato de Sodio

English Title	Spanish Title
Sodium Phosphate	Fosfato de Sodio
Effervescent Sodium Phosphate	Fosfato de Sodio Efervescente
Exsiccated Sodium Phosphate	Fosfato de Sodio Desecado
Sodium Salicylate	Salicilato de Sodio
Sodium Salicylate Tablets	Tabletas de Salicilato de Sodio
Sodium Stearate	Estearato de Sodio
Sodium Sulfate	Sulfato de Sodio
Sodium Sulfite, Exsiccated	Sulfito de Sodio Desecado
Sodium Thiosulfate	Tiosulfato de Sodio
Spearmint	Yerbabuena
Spearmint Oil	Esencia de Yerbabuena
Spearmint Spirit	Espíritu de Yerbabuena
Spearmint Water	Agua de Yerbabuena
Spermaceti	Esperma de Ballena
Starch	Almidón
Starch Glycerite	Glicerito de Almidón
Stearyl Alcohol	Alcohol de Estearilo
Stomach, Powdered	Estómago Pulverizado
Liver with Stomach	Hígado con Estómago
Storax	Estoraque
Compound Benzoin Tincture	Tintura de Benjuí Compuesta
Stramonium	Estramonio
Stramonium Extract	Extracto de Estramonio
Stramonium Tincture	Tintura de Estramonio
Strychnine Sulfate	Sulfato de Estricnina
Strychnine Sulfate Tablets	Tabletas de Sulfato de Estricnina
Succinylsulfathiazole	Succinilsulfatiazol
Succinylsulfathiazole Tablets	Tabletas de Succinilsulfatiazol
Sucrose	Sacarosa
Sulfadiazine	Sulfadiacina
Sulfadiazine Tablets	Tabletas de Sulfadiacina
Sulfadiazine Sodium	Sulfadiacina Sódica
Sulfadiazine Sodium, Sterile	Sulfadiacina Sódica, Estéril
Sulfaguanidine	Sulfaguanidina
Sulfaguanidine Tablets	Tabletas de Sulfaguanidina
Sulfamerazine	Sulfameracina
Sulfamerazine Tablets	Tabletas de Sulfameracina
Sulfamerazine Sodium	Sulfameracina Sódica
Sulfamerazine Sodium, Sterile	Sulfameracina Sódica, Estéril
Sulfanilamide	Sulfanilamida
Sulfanilamide Tablets	Tabletas de Sulfanilamida
Sulfapyridine Sodium	Sulfapiridina Sódica
Sulfarsphenamine	Sulfarsfenamina
Sulfathiazole	Sulfatiazol
Sulfathiazole Tablets	Tabletas de Sulfatiazol
Sulfathiazole Sodium	Sulfatiazol Sódico
Sulfathiazole Sodium, Sterile	Sulfatiazol Sódico, Estéril
Sulfobromophthalein Sodium	Sulfobromoftaleína Sódica
Sulfobromophthalein Sodium Injection	Inyección de Sulfobromoftaleína Sódica
Sulfur, Precipitated	Azufre Precipitado
Sulfur Ointment	Ungüento de Azufre
Sulfur, Sublimed	Azufre Sublimado
Suramin Sodium	Suramina Sódica
Surgical Gut	Catgut Quirúrgico
Surgical Silk	Seda Quirúrgica
Surgical Silk, Sterile	Seda Quirúrgica Estéril
Sutures, Surgical	Suturas, Quirúrgicas
Syrup	Jarabe

English Title	Spanish Title
T	
Talc	Talco
Tar, Coal	Brea de Hulla
Tar, Coal, Ointment	Ungüento de Brea de Hulla
Testosterone Propionate	Propionato de Testosterona
Tetracaine Hydrochloride	Clorhidrato de Tetracaína
Tetrachloroethylene	Tetracloroetileno
Tetrachloroethylene Capsules	Cápsulas de Tetracloroetileno
Theobromine and Sodium Acetate	Teobromina y Acetato de Sodio
Theobromine and Sodium Acetate Capsules	Cápsulas de Teobromina y Acetato de Sodio
Theophylline	Teofilina
Theophylline Tablets	Tabletas de Teofilina
Theophylline and Sodium Acetate	Teofilina y Acetato de Sodio
Theophylline and Sodium Acetate Tablets	Tabletas de Teofilina y Acetato de Sodio
Thiamine Hydrochloride	Clorhidrato de Tiamina
Thiamine Hydrochloride Injection	Inyección de Clorhidrato de Tiamina
Thiamine Hydrochloride Tablets	Tabletas de Clorhidrato de Tiamina
Thiopental Sodium	Tiopental Sódico
Thiopental Sodium, Sterile	Tiopental Sódico, Estéril
Thymol	Timol
Thyroid	Tiroides
Thyroid Tablets	Tabletas de Tiroides
Thyroxin	Tiroxina
Totaquine	Totaquina
Totaquine Capsules	Cápsulas de Totaquina
Totaquine Tablets	Tabletas de Totaquina
Toxin, Diphtheria, Diagnostic	Toxina Difterica para Diagnóstico
Toxin, Scarlet Fever Streptococcus	Toxina del Estreptococo Escarlatinoso (Toxina Estreptoescarlatinosa)
Toxoid, Diphtheria	Toxoide Diftérico
Toxoid, Diphtheria, Alum Precipitated	Toxoide Diftérico, Precipitado con Alumbre
Toxoid, Tetanus	Toxoide Tetánico
Toxoid, Tetanus, Alum Precipitated	ToxoideTetánico, Precipitado con Alumbre
Toxoids, Diphtheria and Tetanus	Toxoides Diftérico y Tetánico
Toxoids, Diphtheria and Tetanus, Alum Precipitated	Toxoides Diftérico y Tetánico, Precipitados con Alumbre
Tragacanth	Tragacanto
Tragacanth Mucilage	Mucílago de Tragacanto
Triasyn B Capsules	Cápsulas de Triasina B
Triasyn B Tablets	Tabletas de Triasina B
Tribromoethanol	Tribromoetanol
Tribromoethanol Solution	Solución de Tribromoetanol
Trichloroethylene	Tricloroetileno
Triethanolamine	Trietanolamina
Tryparsamide	Triparsamida
Tuberculin, Old	Tuberculina Antigua
Tuberculin, Purified Protein Derivative of	Tuberculina, Derivado Proteínico Purificado
U	
Urea	Urea
Urethane	Uretano

English Title	Spanish Title
V	
Vaccine, Cholera	Vacuna Anticolérica
Vaccine, Epidemic Typhus	Vacuna Contra el Tifo Epidémico
Vaccine, Plague	Vacuna Antipestosa
Vaccine, Rabies	Vacuna Antirrábica
Vaccine, Smallpox	Vacuna Antivariólica
Vaccine, Typhoid	Vacuna Antitifoidea
Vaccine, Typhoid and Paratyphoid	Vacuna Antitifoidea y Antiparatifoidea
Vaccine, Yellow Fever	Vacuna Contra la Fiebre Amarilla (Vacuna Antiamarilica)
Vanillin	Vainillina
Vinyl Ether	Eter Vinilico
W	
Water	Agua
Water, Distilled	Agua Destilada
Water, Distilled, Sterile	Agua Destilada Estéril
Water for Injection	Agua para Inyección
Wax, White	Cera Blanca
Wax, Yellow	Cera Amarilla
Wild Cherry	Cerezo Silvestre
Wild Cherry Syrup	Jarabe de Cerezo Silvestre
Wool Fat	Grasa de Lana
Wool Fat, Hydrous	Grasa de Lana Hidratada
Y	
Yeast, Dried	Levadura Desecada
Yeast, Dried, Tablets	Tabletas de Levadura Desecada
Z	
Zinc Oxide	Oxido de Zinc
Zinc Oxide Ointment	Ungüento de Oxido de Zinc
Zinc Peroxide, Medicinal	Peróxido de Zinc, Medicinal
Zinc Stearate	Estearato de Zinc
Zinc Sulfate	Sulfato de Zinc

GENERAL NOTICES
APPLYING TO THE STANDARDS
OF THE
UNITED STATES PHARMACOPŒIA

All pharmacopœial text is subject to the following general provisions and interpretations.

TITLE

The title of this book, including Supplements thereto, is The Pharmacopœia of the United States of America, Thirteenth Revision. This title may be abbreviated to United States Pharmacopœia, Thirteenth Revision, or to U. S. P. XIII. When the term U. S. P. is used, without further qualification, during the period in which this Pharmacopœia is official, it refers to U. S. P. XIII, and includes any Supplements thereto.

OFFICIAL

The word "official," as used in this Pharmacopœia or with reference thereto, is synonymous with "pharmacopœial."

DEVIATIONS PERMITTED

The standards prescribed in this Pharmacopœia apply to the substances, and to the preparations and their ingredients herein named when intended for medicinal use, and when bought, sold, or dispensed for this purpose, or when used in the tests and assays herein provided.

Ingredients and Processes—Official preparations for which processes are given in the Pharmacopœia, unless exempted in the General Notices or in the individual monographs, are to be made only from the official ingredients named in the formulas, and by the official processes.

In the manufacture of any official preparation, deviation in detail from the official directions is permissible, provided the finished preparation conforms to the standards prescribed by the Pharmacopœia, and to those produced by following the official directions. Unless specifically exempted elsewhere in the Pharmacopœia, the identity, strength, quality, and purity of an official article are determined by the definition, description, general description of physical properties, tests, assay methods, and

other specifications relating to the article, whether incorporated in the monograph itself, occurring in any general introductory monograph, in the general notices or in the section on general tests, processes, and apparatus.

Use of Denatured Alcohol—In the manufacture of pharmacopœial preparations in which alcohol is used as a solvent only and does not remain in the finished product, it is permissible to use alcohol denatured by the addition of not more than 10 per cent by volume of methanol or acetone, in place of the alcohol, in accordance with Federal Statutes and regulations of the Bureau of Internal Revenue, but the preparations so made must be identical with those prepared by the processes given in the monographs and must conform to the standards of the Pharmacopœia.

Capsules and Tablets—In the manufacture of tablets and capsules, it is permissible to use suitable diluents, bulking agents, colors, lubricants, and adhesives, such as starches, lactose, sucrose, and other innocuous materials.

In the case of a liquid in capsules, innocuous agents may be added to achieve physical consistence which may enhance the effectiveness, safety, or stability of the product, unless specifically excepted in an individual monograph.

A coating may be applied to official tablets and capsules, provided that it will disintegrate in the alimentary tract and that it is composed of harmless ingredients.

Ointments—In official ointments which contain petrolatum, white petrolatum, yellow wax, or white wax, the proportions of these may be varied to maintain a suitable consistence under different climatic conditions, provided that the proportion of active ingredients is not varied.

Vegetable and Animal Drugs—The official standards and packaging specifications apply to vegetable and animal drugs as they enter commerce, in any form, with the exception that when used solely for the manufacture or isolation of volatile oils, alkaloids, glycosides, or other active principles, they may differ from the standards of strength, quality, purity, or packaging prescribed by the Pharmacopœia.

DOSES

Average Dose—In modern medicine, drugs are given in order to produce certain therapeutic effects. The amount required for this purpose varies with the disease, as well as with the weight, age, and other characteristics of the patient.

The average doses stated in this Pharmacopœia are those which may be expected ordinarily to produce the therapeutic effect for which the ingredient or preparation is most commonly employed. Unless otherwise specified, the average doses are for oral administration to human adults.

Dose Equivalents—Doses are expressed primarily in the metric system but *approximate* equivalents are given for those individuals still using the apothecary system.

The *approximate* dose equivalents in the following table represent the quantities which would be prescribed, under identical conditions, by physicians trained, respectively, in the metric or in the apothecary system of weights and measures.

When prepared dosage forms such as tablets, capsules, pills, etc., are prescribed in the metric system, the pharmacist may dispense the corresponding *approximate* equivalent in the apothecary system, and vice versa, as indicated in the following table.

For converting specific quantities in a prescription which requires compounding, or in converting a pharmaceutical formula from one system of

Table of Metric Doses with Approximate Apothecary Equivalents

		Weight			Weight
Metric		Approximate Apothecary Equivalents	Metric		Approximate Apothecary Equivalents
30	Gm.	1 ounce	40	mg.	⅔ grain
15	Gm.	4 drachms	30	mg.	½ grain
10	Gm.	2½ drachms	25	mg.	⅜ grain
7.5	Gm.	2 drachms	20	mg.	⅓ grain
6	Gm.	90 grains	15	mg.	¼ grain
5	Gm.	75 grains	12	mg.	⅕ grain
4	Gm.	60 grains (1 drachm)	10	mg.	⅙ grain
3	Gm.	45 grains	8	mg.	⅛ grain
2	Gm.	30 grains (½ drachm)	6	mg.	1/10 grain
1.5	Gm.	22 grains	5	mg.	1/12 grain
1	Gm.	15 grains	4	mg.	1/15 grain
0.75	Gm.	12 grains	3	mg.	1/20 grain
0.6	Gm.	10 grains	2	mg.	1/30 grain
0.5	Gm.	7½ grains	1.5	mg.	1/40 grain
0.4	Gm.	6 grains	1.2	mg.	1/50 grain
0.3	Gm.	5 grains	1	mg.	1/60 grain
0.25	Gm.	4 grains	0.8	mg.	1/80 grain
0.2	Gm.	3 grains	0.6	mg.	1/100 grain
0.15	Gm.	2½ grains	0.5	mg.	1/120 grain
0.12	Gm.	2 grains	0.4	mg.	1/150 grain
0.1	Gm.	1½ grains	0.3	mg.	1/200 grain
75	mg.	1¼ grains	0.25	mg.	1/250 grain
60	mg.	1 grain	0.2	mg.	1/300 grain
50	mg.	¾ grain	0.15	mg.	1/400 grain
			0.12	mg.	1/500 grain
			0.1	mg.	1/600 grain

Liquid Measure: Metric	Liquid Measure: Approximate Apothecary Equivalents	Liquid Measure: Metric	Liquid Measure: Approximate Apothecary Equivalents
1000 cc.	1 quart	3 cc.	45 minims
750 cc.	1½ pints	2 cc.	30 minims
500 cc.	1 pint	1 cc.	15 minims
250 cc.	8 fluidounces	0.75 cc.	12 minims
200 cc.	7 fluidounces	0.6 cc.	10 minims
100 cc.	3½ fluidounces	0.5 cc.	8 minims
50 cc.	1¾ fluidounces	0.3 cc.	5 minims
30 cc.	1 fluidounce	0.25 cc.	4 minims
15 cc.	4 fluidrachms	0.2 cc.	3 minims
10 cc.	2½ fluidrachms	0.1 cc.	1½ minims
8 cc.	2 fluidrachms	0.06 cc.	1 minim
5 cc.	1¼ fluidrachms	0.05 cc.	¾ minim
4 cc.	1 fluidrachm	0 03 cc.	½ minim

Note—A cubic centimeter (cc.) is the approximate equivalent of a milliliter (ml.).

weights or measures to the other, *exact* equivalents, page 913, must be used.

The recommendation of the Pharmacopœial Convention stated: "It is to be understood that this Convention and the Committee of Revision created by it intend that these doses serve only as a guide to the physician, and that he may exceed the doses given whenever in his judgment this seems advisable."

Usually Available Sizes—The usually available sizes of capsules and tablets, and the concentrations of injections listed under the several monographs are not necessarily identical with the average doses, and are intended solely as information to physicians and pharmacists.

OFFICIAL TITLES

Many of the English titles of monographs in this Pharmacopœia have been derived primarily by a transposition of the word order of former official English titles. The former official English titles, and other names derived by transposition of the definitive words of an official title, shall be considered to be synonyms of the official title.

PACKAGING, STORAGE, AND PRESERVATION

Containers

Container—The container is the device which holds the drug and which is or may be in direct contact with the drug. The *closure* of the container is a part of the container.

The container shall not interact physically or chemically with the drug which it holds so as to alter the strength, quality, or purity of the drug beyond the official requirements.

Well-closed Container—A well-closed container shall protect the contents from extraneous solids or from loss of the drug under the ordinary or customary conditions of handling, shipment, storage, or sale.

Tight Container—A tight container shall protect the contents from contamination by extraneous solids or moisture, from loss of the drug, and from efflorescence, deliquescence, or evaporation under the ordinary or customary conditions of handling, shipment, storage, or sale, and shall be capable of tight reclosure. Where a tight container is specified, it may be replaced by a hermetic container for a single dose of a drug.

Hermetic Container—A hermetic container shall be impervious to air or any other gas under the ordinary or customary conditions of handling, shipment, storage, or sale.

Light-resistant Container—A light-resistant container is a container which is opaque, or designed to prevent photo-chemical deterioration of the contents beyond the official limits of strength, quality, or purity, under the ordinary or customary conditions of handling, shipment, storage, or sale.

Unless otherwise directed, a light-resistant container shall be composed of a substance which in a thickness of 2 mm. shall not transmit more than 10 per cent of the incident radiation of any wave length between 2900 and 4500 Ångströms, page 634.

If the walls of a container are less than 2 mm. in thickness, the same 10 per cent limit of light transmission shall apply.

If the container is not light-resistant, it must be provided with an opaque covering, be enclosed in an opaque covering or in an opaque container.

Temperatures

Cold place—A cold place shall be a place having a temperature not exceeding 15° (59° F.).

Refrigerator—When a refrigerator is specified, a temperature between 2° and 15° (36° and 59° F.) is indicated.

Excessive heat or excessive temperature—When the terms *excessive heat* or *excessive temperature* are used, a temperature which exceeds 49° (120° F.) is indicated.

Bulk Packages—Unless otherwise directed in the monograph, storage requirements shall not apply to bulk packages from importers, manufacturers or wholesale distributors when the products are intended for manufacture or for subsequent repackaging for the dispenser or retail distributor.

Non-specific Storage Conditions—Where no reference is made to specific storage conditions or to the necessity of keeping in a "cold place" or of the avoidance of "excessive heat," normal living conditions are suitable for the storage of such drugs.

Added Substances—For the preservation of solutions of organic substances intended for parenteral administration or topical application, in addition to Injections, there may be added to the solutions, unless otherwise directed in the monograph, not more than 0.5 per cent of chlorobutanol, cresol, phenol, sulfur dioxide, sodium bisulfite, or other suitable preservative. The presence and proportion of a preservative shall be plainly declared on the label of the container in which the product is sold or dispensed. Not more than 0.9 per cent of sodium chloride may be present, and the air in the container may be evacuated or be replaced by carbon dioxide, or by nitrogen.

Substances, unless otherwise provided in the individual monograph, may be added to pharmacopœial preparations to assure the permanency or usefulness of the products, but these substances must be non-toxic and harmless in the amounts administered and must not interfere with the therapeutic efficacy of the preparations.

Labeling—The labeling requirements of the Pharmacopœia do not apply to shipping containers unless such containers are also essentially the immediate containers or the outside containers or wrappers of the retail packages.

Labeling Vitamin-containing Products—The vitamin content per ampul, capsule, or tablet, or per cc. for injections, or per gram for natural oils or bulk solutions, shall be stated on the label in U. S. P. Units for vitamins A and D and in milligrams for each of the other vitamins.

TESTING

Apparatus—When a container or implement of definite size and shape is recommended in the directions for a test or an assay, it is not obligatory except when volumetric flasks, measuring burettes, or other exact measuring apparatus or classifying or sorting implements are specified.

Assays and Tests—The strength of drugs or preparations for which assay processes are provided, and the limit of other substances in official drugs, are to be determined by the official processes.

Tests for the presence of foreign substances are intended to limit such substances to amounts which would be unobjectionable under conditions in which the medicinal agents are employed.

In stating the quantities to be used for assays, an appropriate amount

is specified. The word "about" is used to indicate that this amount need not be the exact quantity specified, but it should not deviate more than plus or minus 10 per cent. This quantity is accurately weighed, and the result of the test or assay is based upon this exact weight.

Chemical Formulas—Chemical formulas, other than those in the definitions, tests, and assays, are given in this Pharmacopœia for the purpose of information and calculation.

Concentrations of Solutions for Testing—Such phrases as "(1 in 10)," "(1 in 20)," etc., are understood to mean that 1 part by volume of a liquid is to be diluted with, or 1 part by weight of a solid dissolved in, sufficient of the solvent to make the volume of the finished solution 10 or 20 parts by volume.

Distilled Water—Where water is referred to in tests, *Distilled Water*, page 600, shall be used.

Drying to Constant Weight—The term "dried to constant weight" means that two consecutive weighings do not differ by more than 0.5 mg. per Gm. of substance taken for the determination, the second weighing following an additional hour of drying.

Negligible—The term "negligible" means a quantity not exceeding 0.5 mg.

Percentage Figures—Percentage figures, except those for alcohol, refer to *percentage by weight*, unless otherwise specified in the monograph. Percentage figures without decimals signify *exactly* the minimum or maximum: thus 99 per cent means 99.00 per cent. All statements of percentages of alcohol refer to percentage, by volume, of C_2H_5-OH at 15.56°.

Physical Tests—Pharmacopœial methods only are to be used for conducting the physical tests except in specific cases where other methods are permitted. The ranges specified are inclusive. The methods and details are among the general tests.

Reference Standards—To provide a greater degree of uniformity in certain assays and other tests, Reference Standards have been provided to be used as controls, page 681.

Solubilities—The statements concerning solubilities given under the paragraph entitled Solubility in the pharmacopœial monographs are not intended as standards or tests for purity, but primarily as information required by those employed in connection with the preparation and dispensing of medicines. When a special test involving solubility is given, including the solubility of volatile oils in alcohol of specific

strength, the test for such solubility is intended as a test for purity and the substance must conform to the test.

Except as indicated above the solubility of pharmacopœial compounds in the given solvents is considered to be of minor importance as a means of identification or determination of purity; for these purposes dependence is placed upon the other tests directed in the monographs.

Solutions—Unless otherwise specified in the individual monograph, all solutions referred to are solutions in distilled water.

Specific Gravity—Unless otherwise stated, the specific gravity basis is $\frac{25^\circ}{25^\circ}$, *i. e.*, the ratio of the weight of a substance in air at 25° to that of an equal volume of water at the same temperature.

Sterile Products—Pharmacopœial substances required to be sterile shall meet the *Sterility Test for Liquids and Solids*, page 689. They shall be kept in containers so closed that sterility is maintained until the containers are opened for use.

Temperatures—Unless otherwise specified, all temperatures in this Pharmacopœia are expressed in centigrade degrees. All measurements are made at 25° unless otherwise directed.

Time Limitations—In testing pharmacopœial chemicals for impurities (*chloride, sulfate, etc.*), 5 minutes shall be allowed for the reaction to be observed unless otherwise specified.

Unofficial Methods for Detecting Added Foreign Substances—Inasmuch as the primary object of the Pharmacopœia is to assure the user of official medicinal substances of their identity, strength, quality, and purity, and as it is manifestly impossible to include in each monograph a test for every impurity or adulterant that might be present, it is to be understood that the presence of any added foreign substance, which could not have resulted from the use of the ingredients in an official formula, constitutes a variation from the official standard. The proof of such variation may be based upon the application of recognized scientific methods, whether such methods appear in the Pharmacopœia or not.

Water Bath and Steam Bath—The terms *water bath* and *steam bath* are used synonymously. When a water bath is directed, the water shall be boiling unless otherwise specified. When a water bath is directed, a bath of actively flowing steam or another form of regulated heat, corresponding in temperature to that of a water bath, may be used.

VEGETABLE AND ANIMAL DRUGS

Foreign Matter—Vegetable and animal drugs are to be as free as

practicable from molds, insects, and other animal contamination, and from animal excreta. They shall show no abnormal discoloration, abnormal odor, sliminess, or evidence of deterioration.

The amount of foreign inorganic matter in vegetable or animal drugs, estimated as *Acid-insoluble ash*, shall not exceed 2 per cent of the weight of the drug unless otherwise specified in the individual monograph.

Before vegetable drugs are ground or powdered, stones, dust, lumps of dirt or other foreign inorganic matter which can be separated by mechanical means must be removed.

In commerce it is not always possible to obtain vegetable drugs in a state of absolute purity, and a limited amount of innocuous extraneous or foreign matter adhering to the drug or admixed with it is usually not detrimental. The presence or admixture of any poisonous, dangerous, or otherwise noxious foreign substance, however, is not permissible. Foreign organic matter refers to any part of the plant or plants yielding the drug, except that part or those parts designated as constituting the drug, and to any other plant parts, vegetable tissues, or substances.

Preservation—For the protection of vegetable or animal substances from the ravages of insects, it is directed in special cases that they be preserved in suitable containers into which is introduced at intervals a suitable quantity of chloroform, carbon tetrachloride, or other suitable fumigant.

For additional information concerning the standards for vegetable and animal drugs, see page 710.

WEIGHTS AND MEASURES

Metric—The metric system of weights and measures is the official system used in this Pharmacopœia. The units of the metric system commonly employed are designated by abbreviations as follows:

M. = meter	Kg. = kilogram	L. = liter
dm. = decimeter	Gm = gram	dl. = deciliter
cm. = centimeter	dg. = decigram	ml. = milliliter
mm. = millimeter	cg. = centigram	cc.‡ = cubic centimeter
μ = micron*	mg. = milligram	
	μg. = microgram†	

In metric abbreviations, the numerals precede the abbreviations, and

* 1 micron—0.001 mm.

† 1 microgram, sometimes called 1 gamma, equals 0.001 mg.

‡ 1 cubic centimeter (cc.) is used in this Pharmacopœia as the equivalent of 1 milliliter (ml.).

are always written in Arabic characters, thus: 5 Gm.; 2 cc. To distinguish the abbreviation for gram (Gm.) from that for grain (gr.) the former is written with a capital, the latter with a small letter.

Concentrations of Solutions on Prescriptions—Percentage concentrations of solutions are expressed as follows:

Per cent weight in weight—(w/w) expresses the number of grams of an active constituent in 100 grams of solution.

Per cent weight in volume—(w/v) expresses the number of grams of an active constituent in 100 cubic centimeters of solution and is used in prescription practice regardless whether water or some other liquid is the solvent.

Per cent volume in volume—(v/v) expresses the number of cubic centimeters of an active constituent in 100 cubic centimeters of solution.

When *per cent* is used in prescriptions without qualification, it means: for solutions of solids in liquids, per cent weight in volume; for solutions of liquids in liquids, per cent volume in volume; and for solutions of gases in liquids, per cent weight in volume. For example, a 1 per cent solution is prepared by dissolving 1 gram of a solid or 1 cubic centimeter of a liquid in sufficient of the solvent to make 100 cubic centimeters of the solution. A solution of approximately the same strength may be prepared by apothecary weight and measure by dissolving 4.5 grains of a solid or 4.8 minims of a liquid in sufficient of the solvent to make 1 fluidounce of the solution.

In dispensing prescriptions, slight changes in volume owing to variations in room temperatures may be disregarded.

MONOGRAPHS

ON

VEGETABLE AND ANIMAL DRUGS, CHEMICALS, AND PREPARATIONS

ACACIA

Acacia

Acac.—Gum Arabic

Acacia is the dried gummy exudation from the stems and branches of *Acacia Senegal* (Linné) Willdenow, or of some other African species of *Acacia* (Fam. *Leguminosæ*).

Description—

Unground Acacia—In spheroidal tears up to 32 mm. in diameter or in angular fragments; color, white to yellowish white; translucent or somewhat opaque from the presence of numerous minute fissures; very brittle, the fractured surface glassy and occasionally iridescent; almost odorless; taste mucilaginous.

Flake Acacia—In white to yellowish white, thin flakes, appearing under the microscope as colorless, striated fragments.

Powdered Acacia—White to yellowish white; in angular microscopic fragments with but slight traces of starch or vegetable tissues present.

Solubility—Acacia is insoluble in alcohol, but almost completely soluble in twice its weight of water at room temperature, the resulting solution flowing readily and is acid to litmus paper.

Identification—Add 0.2 cc. of diluted lead subacetate T.S. to 10 cc. of a 2 per cent cold solution of Acacia: a flocculent, or curdy, white precipitate is immediately produced.

Total ash—Acacia yields not more than 4 per cent of *Total ash*, pages 710 and 711.

Acid-insoluble ash—Acacia yields not more than 0.5 per cent of *Acid-insoluble ash*, pages 710 and 711.

Moisture—The amount of *Moisture* in Acacia does not exceed 15 per cent when determined by *Method* VII, pages 710 and 712.

Optical rotation—A 10 per cent solution of Acacia shows but slight lævorotation.

Insoluble residue—Dissolve 5 Gm. of powdered or finely ground Acacia in about 100 cc. of water in a 250-cc. Erlenmeyer flask, add 10 cc. of diluted hydrochloric acid, and boil gently for 15 minutes. Filter by suction, while hot, through a filtering crucible, previously tared, wash thoroughly with hot water, dry at 100°, and weigh. The weight of the residue thus obtained does not exceed 50 mg.

Starch or dextrin—Boil a 2 per cent aqueous solution of Acacia, and cool: it does not give a bluish or reddish color with iodine T.S.

Tannin-bearing gums—Add 0.1 cc. of ferric chloride T.S. to 10 cc. of a 2 per cent solution of Acacia: no blackish coloration or blackish precipitate is produced.

Acacia Mucilage

ACACIA MUCILAGE

Mucilago Acaciæ

Mucil. Acac.—Mucilage of Gum Arabic

Acacia, in small fragments........................	350 Gm.
Benzoic Acid........................	2 Gm.
Distilled Water, a sufficient quantity,	
To make........................	1000 cc.

Place the acacia in a graduated bottle having a wide mouth and a capacity not greatly exceeding 1000 cc., wash the drug with cold distilled water, allow it to drain, and add enough warm distilled water, in which the benzoic acid has been dissolved, to make the product measure 1000 cc. After stoppering, lay the bottle on its side, rotating it occasionally, and when the acacia has dissolved strain the mucilage.

Acacia Mucilage may also be prepared by adding 400 cc. of distilled water, in which the benzoic acid has previously been dissolved with the aid of heat, to 350 Gm. of powdered or granular acacia, in a mortar, and triturating until the acacia is dissolved. Then add sufficient distilled water to make the product measure 1000 cc.

Caution—Acacia Mucilage must be free from mold or any other indication of decomposition.

Packaging and storage—Preserve Acacia Mucilage in tight containers.

Average dose—**15 cc.** (approximately 4 fluidrachms).

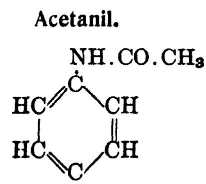
Acetanilid

ACETANILID

Acetanilidum

Acetanil.

C_8H_9NO



Mol. wt. 135.16

Description—Acetanilid occurs as white, shiny crystals, usually in scales, or as a white, crystalline powder. It is odorless, and is stable in air. Its saturated solution is neutral to litmus paper.

Solubility—One Gm. of Acetanilid dissolves in 190 cc. of water, in 3.5 cc. of alcohol, in 4 cc. of chloroform, in about 17 cc. of ether, and in about 5 cc. of glycerin. One Gm. of Acetanilid dissolves in 20 cc. of boiling water, and in about 0.6 cc. of boiling alcohol.

Melting range—Acetanilid melts between 114° and 116°, page 667.

Identification—

A: Boil about 100 mg. of Acetanilid with 5 cc. of sodium hydroxide T.S.: the characteristic odor of aniline becomes noticeable. Add a few drops of chloroform, and again heat the mixture: the disagreeable odor of phenyl isocyanide is developed (*Caution: poisonous*).

B: To about 10 cc. of a saturated solution of Acetanilid add a few drops of bromine T.S.: a white, crystalline precipitate of *p*-bromoacetanilid is produced.

Loss on drying—When dried over sulfuric acid for 4 hours, Acetanilid loses not more than 0.5 per cent of its weight.

Residue on ignition—Acetanilid yields not more than 0.05 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 500 mg. of Acetanilid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Packaging and storage—Preserve Acetanilid in well-closed containers.

AVERAGE DOSE—**0.2 Gm.** (approximately 3 grains).

Acetic Acid, Glacial

GLACIAL ACETIC ACID

Acidum Aceticum Glaciale

Acid. Acet. Glac.

$C_2H_4O_2$ $CH_3.COOH$ Mol. wt. 60.05

Glacial Acetic Acid contains not less than 99.4 per cent of $C_2H_4O_2$.

Description—Glacial Acetic Acid is a colorless, clear liquid, having a pungent, characteristic odor, and, when well diluted with water, an acid taste. It boils at about 118°.

Solubility—Glacial Acetic Acid is miscible with water, with alcohol, and with glycerin.

Congealing temperature—Glacial Acetic Acid congeals at a temperature not lower than 15.6°, page 629.

Identification—A mixture of 1 volume of Glacial Acetic Acid with 2 volumes of water responds to the tests for *Acetate*, page 658.

Non-volatile residue—Evaporate 20 cc. of Glacial Acetic Acid in a tared dish, and dry at 100° for 2 hours: the weight of the residue does not exceed 1 mg.

Chloride—Dilute 1 cc. of Glacial Acetic Acid with 20 cc. of water, and add 5 drops of silver nitrate T.S.: no opalescence is produced.

Sulfate—Dilute 1 cc. of Glacial Acetic Acid with 10 cc. of water, and add 1 cc. of barium chloride T.S.: no turbidity is produced.

Heavy metals—Evaporate 5 cc. of Glacial Acetic Acid to dryness in a porcelain dish on a water bath. Warm the residue with 2 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Glacial Acetic Acid is 10 parts per million.

Readily oxidizable substances—Dilute 2 cc. of Glacial Acetic Acid in a glass-stoppered vessel with 10 cc. of water, and add 0.1 cc. of tenth-normal potassium permanganate: the pink color is not changed to brown within 2 hours.

Assay—Measure about 2 cc. of Glacial Acetic Acid into a tared, glass-stoppered flask, and weigh accurately. Add 40 cc. of water, and titrate with normal sodium

hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 60.05 mg. of $C_2H_4O_2$.
Packaging and storage—Preserve Glacial Acetic Acid in tight containers.

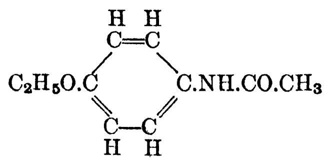
Acetophenetidin

ACETOPHENETIDIN

Acetophenetidinum

Acetphen.—Acetphenetidin, Phenacetin

$C_{10}H_{13}O_2N$



Mol. wt. 179.21

Description—Acetophenetidin occurs as white, glistening crystals, usually in scales, or as a fine, white, crystalline powder. It is odorless, and is stable in air. Its saturated solution is neutral to litmus paper.
Solubility—One Gm. of Acetophenetidin dissolves in about 1300 cc. of water, in 15 cc. of alcohol, in 15 cc. of chloroform, and in about 130 cc. of ether. One Gm. of Acetophenetidin dissolves in 85 cc. of boiling water, and in about 3 cc. of boiling alcohol.
Melting range—Acetophenetidin melts between 134° and 136°, page 667.
Identification—Boil about 100 mg. of Acetophenetidin for 1 minute with 1 cc. of hydrochloric acid, dilute with 10 cc. of water, cool, filter, and add 1 drop of potassium dichromate T.S. to the filtrate: the mixture slowly develops a ruby red color.
Loss on drying—When dried over sulfuric acid for 4 hours, Acetophenetidin loses not more than 0.5 per cent of its weight.
Residue on ignition—Acetophenetidin yields not more than 0.05 per cent of residue on ignition, page 685.
Readily carbonizable substances—Dissolve 500 mg. of Acetophenetidin in 5 cc. of sulfuric acid: the solution has no more color than matching fluid T, page 680.
Acetanilid—Boil about 500 mg. of Acetophenetidin with 10 cc. of water for 1 minute, cool, filter, and add bromine T.S. to the filtrate, drop by drop, agitating after each addition until the solution remains permanently yellow: neither turbidity nor precipitation results.
Packaging and storage—Preserve Acetophenetidin in well-closed containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Acetophenetidin Tablets

ACETOPHENETIDIN TABLETS

Tabellæ Acetophenetidini

Tab. Acetphen.—Phenacetin Tablets

Acetophenetidin Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $C_{10}H_{13}O_2N$.

Identification—Triturate a quantity of finely powdered Acetophenetidin Tablets, equivalent to about 500 mg. of acetophenetidin, with two 5-cc. portions of ether, and discard the ether. Macerate the residue with 20 cc. of alcohol for 30 minutes, then filter, evaporate the filtrate to dryness on a steam bath, and dry the residue at about 80°. The acetophenetidin so obtained responds to the *Identification test* under *Acetophenetidin*, page 14, and when recrystallized from hot water and dried at 80°, it melts between 134° and 136°.

Acetanilid—Boil 200 mg. of the acetophenetidin obtained in the assay with 5 cc. of water for 1 minute, cool, filter, and add bromine T.S., dropwise, to the filtrate, agitating after each addition until the solution remains permanently yellow: not more than slight turbidity results.

Assay—Weigh a counted number of not less than 20 Acetophenetidin Tablets and reduce them to a fine powder without appreciable loss. Digest an accurately weighed portion of the powder, equivalent to about 300 mg. of acetophenetidin, with two 10-cc. portions of petroleum benzin for 10 minutes, and decant each time through a small filter paper moistened with petroleum benzin. Discard the benzin extracts. Macerate the residue with 20 cc. of chloroform during 30 minutes with frequent agitation, then decant the liquid through the same filter as the petroleum benzin into a tared beaker. Again macerate the residue with 15 cc. of chloroform for 20 minutes and filter through the same filter. Wash the vessel in which the maceration was made and the filter with several 5-cc. portions of warm chloroform until the acetophenetidin is completely extracted. Evaporate the combined chloroform extract with the aid of a current of dry air and dry the residue to constant weight at about 60°, cool, and weigh.

Packaging and storage—Preserve Acetophenetidin Tablets in well-closed containers.

Sizes—Acetophenetidin Tablets usually available contain the following amounts of acetophenetidin: 120, 200, and 300 mg. (2, 3, and 5 grains).

AVERAGE DOSE OF ACETOPHENETIDIN—**0.3 Gm.** (approximately 5 grains).

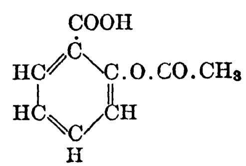
Acetylsalicylic Acid

ACETYLSALICYLIC ACID

Acidum Acetylsalicylicum

Acid. Acetylsal.—Aspirin

$C_9H_8O_4$



Mol. wt. 180.15

Acetylsalicylic Acid, when dried over sulfuric acid for 5 hours, contains not less than 99.5 per cent of $C_9H_8O_4$.

Description—Acetylsalicylic Acid occurs as white crystals, commonly tabular or needle-like, or as a white, crystalline powder. It is stable in dry air; in moist air it gradually hydrolyzes into salicylic and acetic acids. It is odorless.

Solubility—One Gm. of Acetylsalicylic Acid dissolves in about 300 cc. of water, in 5 cc. of alcohol, in 17 cc. of chloroform, and in from 10 to 15 cc. of ether. It is less soluble in absolute ether. Acetylsalicylic Acid dissolves with decomposition in solutions of alkali hydroxides and carbonates.

Identification—
A: Heat Acetylsalicylic Acid with water for several minutes, cool, and add a drop or two of ferric chloride T.S.: a violet red color is produced.
B: Boil about 500 mg. of Acetylsalicylic Acid with 10 cc. of sodium hydroxide T.S. for a few minutes, cool, and add 10 cc. of diluted sulfuric acid: a white precipitate of salicylic acid is produced, and the odor of acetic acid is perceptible. Filter, add to the filtrate 3 cc. of alcohol and 3 cc. of sulfuric acid, and warm: the odor of ethyl acetate becomes noticeable.

Loss on drying—When dried over sulfuric acid for 5 hours, Acetylsalicylic Acid loses not more than 0.5 per cent of its weight.

Residue on ignition—Acetylsalicylic Acid yields not more than 0.05 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 500 mg. of Acetylsalicylic Acid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid Q, page 580.

Chloride—Boil 1.5 Gm. of Acetylsalicylic Acid with 75 cc. of water for 5 minutes, cool, add sufficient water to restore the original volume, and filter. A 25-cc. portion of the filtrate shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 25-cc. portion of the filtrate prepared for the test for *Chloride* shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Free salicylic acid—Dissolve 100 mg. of Acetylsalicylic Acid in 1 cc. of alcohol, dilute the solution with 48 cc. of cold water, and add at once 1 cc. of a freshly prepared diluted ferric ammonium sulfate solution (made by adding 1 cc. of normal hydrochloric acid to 2 cc. of ferric ammonium sulfate T.S. and diluting with water to 100 cc.): at the end of one-half minute the color of the mixture is not more intense than that similarly observed in a control solution prepared as follows: dissolve 100 mg. of salicylic acid in 1000 cc. of water, and add 1 cc. of glacial acetic acid; mix 1 cc. of this solution with 1 cc. of alcohol and 48 cc. of cold water, and add 1 cc. of the diluted ferric ammonium sulfate solution previously employed.

Heavy metals—Dissolve 1 Gm. of Acetylsalicylic Acid in 25 cc. of acetone, add 1 cc. of water and 10 cc. of hydrogen sulfide T.S. Any color produced is not darker than that of a control made with 25 cc. of acetone, 1 cc. of standard lead solution, page 657, and 10 cc. of hydrogen sulfide T.S. (10 parts per million).

Substances insoluble in sodium carbonate T.S.—A solution of 500 mg. of Acetylsalicylic Acid in 10 cc. of warm sodium carbonate T.S. is clear.

Assay—Place about 1.5 Gm. of Acetylsalicylic Acid, previously dried over sulfuric acid for 5 hours and accurately weighed, in a flask, add 50 cc. of half-normal sodium hydroxide, and boil the mixture gently for 10 minutes. Titrate the excess of sodium hydroxide with half-normal sulfuric acid, using 3 drops of phenolphthalein T.S. as the indicator. Determine the normality of the sodium hydroxide in the same manner as in the test. Each cc. of half-normal sodium hydroxide is equivalent to 45.04 mg. of $C_9H_8O_4$.

Packaging and storage—Preserve Acetylsalicylic Acid in well-closed containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Acetylsalicylic Acid Tablets

ACETYLSALICYLIC ACID TABLETS

Tabellæ Acidi Acetylsalicylici

Tab. Acid. Acetylsal.—Aspirin Tablets

Acetylsalicylic Acid Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_9H_8O_4$.

Identification—

A: Crush an Acetylsalicylic Acid Tablet, boil it with 50 cc. of water for 5 minutes, cool, and add 1 or 2 drops of ferric chloride T.S.: a violet red color is produced.

B: Digest a quantity of finely powdered Acetylsalicylic Acid Tablets, equivalent to about 500 mg. of acetylsalicylic acid, with 10 cc. of sodium carbonate T.S. for 5 minutes, and filter. Boil the filtrate for 1 or 2 minutes, cool, and add an excess of diluted sulfuric acid: a white precipitate of salicylic acid is produced and the odor of acetic acid is perceptible. Filter the mixture when cold, add 3 cc. of alcohol and 3 cc. of sulfuric acid to the filtrate, and warm the mixture: the odor of ethyl acetate becomes noticeable.

Assay—Weigh a counted number of not less than 20 Acetylsalicylic Acid Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 500 mg. of acetylsalicylic acid, transfer it completely to an Erlenmeyer flask with the aid of 20 cc. of neutralized alcohol, previously cooled to from 15° to 20°, and titrate the solution immediately with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Add to the titrated solution a volume of tenth-normal sodium hydroxide equal to that used in the titration, plus 15 cc. more, and heat the mixture in a bath of boiling water for 15 minutes with frequent agitation. Remove the flask from the water bath, cool it quickly to room temperature, and titrate with tenth-normal sulfuric acid. Determine the normality of the tenth-normal sodium hydroxide by titrating the same volume of the sodium hydroxide as used in the second addition and in the presence of the same volume of neutralized alcohol, adding sufficient water to make the same volume of liquid, and heating for the same length of time and in the same manner as described above. Subtract the number of cc. of tenth-normal sulfuric acid used from the number of cc. of tenth-normal sodium hydroxide added the second time, and multiply the difference by 18.02. The result represents the milligrams of acetylsalicylic acid present in the portion of the Tablets used for the assay.

Packaging and storage—Preserve Acetylsalicylic Acid Tablets in well-closed containers.

Sizes—Acetylsalicylic Acid Tablets usually available contain the following amounts of acetylsalicylic acid: 60 mg. and 300 mg. (1 and 5 grains).

AVERAGE DOSE OF ACETYLSALICYLIC ACID—**0.3 Gm.** (approximately 5 grains).

Acids

Acids, continued

Agar

AGAR

Agar

Agar-Agar

Agar is the dried hydrophilic, colloidal substance extracted from *Gelidium cartilagineum* (Linné) Gaillon (Fam. *Gelidiaceæ*) and from related red algæ (Class *Rhodophyceæ*).

Description—

Unground Agar—Usually in bundles consisting of thin, membranous, agglutinated pieces; or cut, flaked or granulated; externally weak yellowish orange, yellowish green, yellowish gray, pale yellow or colorless; tough when damp, brittle when dry; odorless or with a slight odor and a mucilaginous taste.

Histology—Granular and somewhat filamentous; a few fragments of the spicules of sponges and a few frustules of diatoms may be present; in Japanese Agar, the frustules of *Arachnoidiscus Ehrenbergii* Baillon, are disc-shaped and from 100 to 300 microns in diameter.

Powdered Agar—White to yellowish white or pale yellow; in chloral hydrate T.S., fragments transparent, more or less granular, striated, angular, occasionally containing frustules of diatoms.

Solubility—Agar is insoluble in cold water, but soluble in boiling water.

Identification—

A: Iodine T.S. colors some of the fragments of Agar bluish black, with some areas reddish to violet.

B: When boiled with 65 times its weight of water for 10 minutes, with constant stirring, and adjusted to one and one half per cent, by weight, with hot water, agar forms a clear liquid which congeals at 32° to 39° to form a firm, resilient gel, which does not melt below 85°.

Moisture—The amount of *Moisture* in Agar does not exceed 20 per cent when determined by Method VII but drying at 105° instead of 100°.
Acid-insoluble ash—Agar yields not more than 0.5 per cent of *Acid-insoluble ash*, on a dry weight basis, pages 710 and 711.
Total ash—Agar yields not more than 6.5 per cent of *Total ash* on a dry weight basis, pages 710 and 711.
Foreign organic matter—The amount of *Foreign organic matter* in Agar does not exceed 1 per cent, pages 710 and 711.
Foreign insoluble matter—Boil 7.5 Gm. of Agar in sufficient water to make 500 Gm., for 15 minutes, and readjust to the original 500 Gm. To 100 Gm. of the uniformly mixed material add hot water to make 200 cc., heat almost to boiling, filter while hot through a tared Gooch crucible, rinse the container with several portions of hot water, and pass these rinsings through the crucible. Dry the crucible and its contents at 105° to constant weight: not more than 1 per cent of residue remains, calculated on the dry weight basis of the 1.5 Gm. of Agar represented.
Foreign starch—A solution made by boiling 100 mg. of Agar in 100 cc. of water does not, upon cooling, produce a blue color upon the addition of iodine T.S.
Gelatin—Dissolve about 1 Gm. of Agar in 100 cc. of boiling water, and allow to cool to about 50°. To 5 cc. of the solution add 5 cc. of picric acid T.S.: no turbidity appears within 10 minutes.
Water absorption—Agar absorbs at least 5 times its weight of water when determined as follows: Place 5 Gm. of Agar in a 100-cc. graduated cylinder, fill to the mark with water, mix well and allow to stand at 25° for 24 hours, pour the contents of the cylinder through moistened glass wool, allowing the water to drain into a second 100-cc. graduated cylinder: not more than 75 cc. of water should be obtained.

AVERAGE DOSE—**4 Gm.** (approximately 1 drachm).

Alcohol

ALCOHOL

Alcohol

Ethanol, Ethyl Alcohol, Spiritus Vini Rectificatus

C_2H_5OH $CH_3.CH_2.OH$ Mol. wt. 46.07

Alcohol contains not less than 92.3 per cent by weight, corresponding to 94.9 per cent by volume, at 15.56°, of C_2H_5OH.

Description—Alcohol is a transparent, colorless, mobile, and volatile liquid. It has a slight, characteristic odor and a burning taste. Alcohol is readily volatilized even at low temperatures and boils at about 78°. It is inflammable.
Solubility—Alcohol is miscible with water, with ether, and with chloroform.
Clarity of dilution—When Alcohol is diluted with water, the mixture is free from cloudiness and remains so after cooling to 5° to 10° for 30 minutes.
Specific gravity—The specific gravity of Alcohol is not more than 0.816 at 15.56°, indicating not less than 92.3 per cent by weight of C_2H_5OH.

Acid—To 50 cc. of Alcohol in a glass-stoppered flask add 50 cc. of recently boiled water. Add a few drops of phenolphthalein T.S. and titrate with fiftieth-normal sodium hydroxide to a pink color that persists for one-half minute: not more than 0.9 cc. of fiftieth-normal sodium hydroxide is required for neutralization.

Residue on evaporation—Evaporate 40 cc. of Alcohol in a tared platinum or porcelain dish on a water bath, and dry at 100°: the weight of the residue does not exceed 1 mg.

Fusel oil constituents—Mix 10 cc. of Alcohol with 5 cc. of water and 1 cc. of glycerin, and allow the mixture to evaporate spontaneously from clean, odorless absorbent paper: no foreign odor is perceptible when the last traces of Alcohol leave the paper.

Amyl alcohol or non-volatile, carbonizable substances, etc.—Allow 25 cc. of Alcohol to evaporate spontaneously in a porcelain dish, carefully protected from dust, until the surface of the dish is barely moist: no red or brown color is produced upon the addition of a few drops of sulfuric acid.

Aldehydes and other foreign organic substances—Place 20 cc. of Alcohol in a glass-stoppered cylinder that has been thoroughly cleaned with hydrochloric acid, then rinsed with water and finally with the Alcohol to be tested. Cool the contents to approximately 15° and add, by means of a carefully cleaned pipette, 0.1 cc. of tenth-normal potassium permanganate, noting the exact time of addition. Mix at once by inverting the stoppered cylinder, and allow it to stand at 15° for 5 minutes: the pink color does not entirely disappear.

Ketones, isopropyl alcohol, and tertiary butyl alcohol—To 1 cc. of Alcohol add 3 cc. of water and 10 cc. of mercuric sulfate T.S., and heat in a bath of boiling water: no precipitate forms within 3 minutes.

Methanol—To 1 drop of Alcohol add 1 drop of water, 1 drop of dilute phosphoric acid (1 in 20), and 1 drop of a solution of potassium permanganate (1 in 20). Mix, allow to stand 1 minute, and add a solution of sodium bisulfite (1 in 20), dropwise, until the permanganate color is discharged. If a brown color remains, add 1 drop of the diluted phosphoric acid. To the colorless solution add 5 cc. of freshly prepared chromotropic acid T.S. and heat on a water bath for 10 minutes at 60°: no violet color appears.

Packaging and storage—Preserve Alcohol in tight containers, remote from fire.

Alcohol, Diluted

DILUTED ALCOHOL

Alcohol Dilutum

Alcohol Dil.—Diluted Ethanol

Diluted Alcohol is a mixture of alcohol and water containing not less than 41 per cent and not more than 42 per cent by weight, corresponding to not less than 48.4 per cent and not more than 49.5 per cent by volume, at 15.56°, of C_2H_5OH.

Diluted Alcohol may be prepared as follows:

ALCOHOL	500 cc.
DISTILLED WATER	500 cc.

Measure the alcohol and the distilled water separately at the same temperature, and mix them. If the two liquids are measured at 25°, the mixture, when cooled to the same temperature, will measure about 970 cc.

Description—Diluted Alcohol is a transparent, colorless, mobile liquid, having a characteristic odor and a burning taste.
Specific gravity—The specific gravity of Diluted Alcohol is not less than 0.935 and not more than 0.937 at 15.56°, indicating not less than 41 per cent and not more than 42 percent by weight of C_2H_5 OH.
Other tests—In other respects Diluted Alcohol complies with the tests under *Alcohol*, page 19, allowance being made for the difference in alcohol concentration.
Packaging and storage—Preserve Diluted Alcohol in tight containers, remote from fire.

PAGE
Alcohol, Stearyl. . 514

Almond Oil, Expressed

EXPRESSED ALMOND OIL

Oleum Amygdalæ Expressum

Ol. Amygd. Exp.—Sweet Almond Oil

Expressed Almond Oil is the fixed oil obtained from the kernels of varieties of *Prunus Amygdalus* Batsch (Fam. *Rosaceæ*).

Description—Expressed Almond Oil is a clear, pale straw colored or colorless, oily liquid. It is almost odorless, and has a bland taste. It remains clear at −10°, and does not congeal until cooled to nearly −20°.
Solubility—Expressed Almond Oil is slightly soluble in alcohol, but is miscible with ether, chloroform, benzene, and with petroleum benzin.
Specific gravity—The specific gravity of Expressed Almond Oil is not less than 0.910 and not more than 0.915.
Foreign kernel oils—Shake vigorously for 5 minutes 2 cc. of Expressed Almond Oil with a mixture of 1 cc. of fuming nitric acid and 1 cc. of water: the mixture is not more than slightly colored.
Cottonseed or sesame oil—Expressed Almond Oil meets the requirements of the tests for *cottonseed oil* and for *sesame oil* under *Olive Oil*, page 357.
Mineral oil and foreign fatty oils—Heat on a water bath 10 cc. of Expressed Almond Oil with 15 cc. of a solution of sodium hydroxide (1 in 6) and 30 cc. of alcohol in a flask which has a small, short-stemmed funnel inserted in the neck, and occasionally agitate the mixture until it becomes clear. Transfer the solution to a shallow dish, evaporate the alcohol on a water bath, and mix the residue with 100 cc. of water: a clear solution results (*mineral oil*). Add an excess of hydrochloric acid to this solution, remove the layer of fatty acids which rises to the surface, wash it with warm water, clarify it by heating on a water bath, and allow it to cool to 15° without stirring: the fatty acids remain clear for 30 minutes at this temperature (*foreign fatty oils*).
Foreign oils—One volume of the mixed fatty acids obtained in the preceding test, when mixed with 1 volume of alcohol, yields a clear solution, which at 15° does not deposit any fatty acid or become turbid upon the further addition of 1 volume of alcohol (*olive*, *peanut*, or *other fixed oils*).

Iodine value—The iodine value of Expressed Almond Oil is not less than 95 and not more than 105, page 645.
Saponification value—The saponification value of Expressed Almond Oil is not less than 190 and not more than 200, page 645.
Packaging and storage—Preserve Expressed Almond Oil in tight containers.

Aloe

ALOE

Aloe

Aloes

Aloe is the dried juice of the leaves of *Aloe Perryi* Baker, known in commerce as Socotrine Aloe, or of *Aloe barbadensis* Miller (*Aloe vera* "Linné"), known in commerce as Curaçao Aloe, or of *Aloe ferox* Miller and hybrids of this species with *Aloe africana* Miller and *Aloe spicata* Baker, known in commerce as Cape Aloe (Fam. *Liliaceæ*).

Aloe yields not less than 50 per cent of water-soluble extractive, pages 710 and 715.

Description—
Unground Socotrine Aloe—In reddish black to brownish black, opaque, smooth, and glistening masses; fractured surface somewhat conchoidal; odor characteristic.
Unground Curaçao Aloe—In brownish black, opaque masses; fractured surface uneven, waxy, somewhat resinous; odor characteristic, disagreeable.
Unground Cape Aloe—In dusky to dark brown irregular masses, the surfaces of which are often covered with a yellowish powder; fracture smooth and glassy; odor characteristic, somewhat sour and disagreeable.
The taste of each variety of Aloe is nauseous and very bitter.
Powdered Aloe—Dark yellow, yellowish brown to olive brown; mounted in a bland expressed oil it appears as greenish yellow to reddish brown angular or irregular fragments, the hues of which depend to some extent upon the thickness of the fragments.

Identification—
A: Powdered Aloe dissolves in nitric acid with effervescence, forming a reddish brown to brown or green solution.
B: Intimately mix in a flask or bottle 1 Gm. of finely powdered Aloe with 25 cc. of cold water, shake the mixture occasionally during 2 hours, transfer it to a filter, and wash the filter and residue with sufficient cold water to make the filtrate measure 100 cc.: the color of the filtrate, viewed in the bulb of a 100-cc. volumetric flask, is dark yellow with Socotrine Aloe, dark orange with Curaçao Aloe, and greenish yellow with Cape Aloe. The filtrate darkens on standing.
C: To 5 cc. of the filtrate obtained in *Test B*, add 2 cc. of nitric acid: the mixture is of an orange yellow color with Socotrine Aloe, a reddish orange color with Curaçao Aloe, and a reddish brown color which changes rapidly to green with Cape Aloe.

D: To 5 cc. of the filtrate obtained in *Test B*, add 45 cc. of water and 20 cc. of a solution of sodium borate (1 in 20): the mixture develops a greenish yellow or yellowish green fluorescence, and upon standing acquires a moderate yellowish orange to brown color.

Moisture—The amount of *Moisture* in Aloe does not exceed 12 per cent when determined by *Method VII*, or by *Method IX*, pages 710 and 712.

Ash—Aloe yields not more than 4 per cent of *ash*, pages 710 and 711.

Alcohol-insoluble matter—Add about 1 Gm. of powdered Aloe, accurately weighed, to 50 cc. of alcohol in a flask. Heat the mixture to boiling, and maintain at incipient boiling for 15 minutes, replacing any loss by evaporation. Remove from the heat, and shake the mixture at intervals during 1 hour, filter through a small dried and tared filter paper or a suitable dried and tared filtering crucible, and wash the residue on the filter with alcohol until the washings are colorless. Dry this residue to constant weight at 100°, and weigh. The weight of the residue does not exceed 10 per cent of the weight of the Aloe taken for the test.

Assay—Determine the per cent of water-soluble extractive in Aloe as directed on pages 710 and 715.

AVERAGE DOSE—**0.25 Gm.** (approximately 4 grains).

ALOIN

Aloinum

Aloin.

Aloin is a mixture of active principles obtained from aloe. It varies in chemical composition and in physical and chemical properties according to the variety of aloe from which it is obtained.

Description—Aloin occurs as a lemon yellow to dark yellow, microcrystalline powder, or as minute crystals. It is odorless, or has a slight odor of aloe. Its taste is intensely bitter. Aloin darkens on exposure to light and air. A saturated solution of Aloin is yellow but becomes brown on standing.

Solubility—Aloin is soluble in water, in alcohol, and in acetone, the degree of solubility varying with its composition. It is slightly soluble in ether.

Identification—

A: Aloin is soluble in ammonia T.S. and in solutions of alkali hydroxides, forming red solutions (or yellow solutions that become red) having a green fluorescence.

B: A drop of ferric chloride T.S. added to an alcohol solution of Aloin produces a brownish green color.

Reaction—A saturated solution of Aloin is neutral or not more than faintly acid to litmus paper.

Residue on ignition—Aloin yields not more than 0.6 per cent of residue on ignition, page 685.

Water-insoluble substances—Place about 1 Gm. of Aloin, accurately weighed, in 120 cc. of water, at 25°, and agitate it frequently during 2 hours. Collect the undissolved residue, if any, on a filter paper or in a filtering crucible, tared after it has been dried at 100°, wash the residue with 25 cc. of water, and dry it at 100°: the weight of the dried residue does not exceed 1.5 per cent of the weight of Aloin taken for the test.

Emodin—Shake 1 Gm. of Aloin with 10 cc. of benzene for 1 minute, filter, then shake the filtrate with 10 cc. of a mixture of equal volumes of ammonia T.S. and water: the pink color produced, if any, is not more intense than that of a solution made by diluting 0.4 cc. of cobaltous chloride C.S. with 4.6 cc. of water, both solutions being viewed horizontally in matched test tubes.

Packaging and storage—Preserve Aloin in tight, light-resistant containers.

AVERAGE DOSE—**15 mg.** (approximately ¼ grain).

Alum

ALUM

Alumen

Alum.

$AlNH_4(SO_4)_2.12H_2O$	Ammonium Alum	Mol. wt. 453.32
$AlK(SO_4)_2.12H_2O$	Potassium Alum	Mol. wt. 474.38

Alum contains not less than 99.5 per cent of $AlNH_4(SO_4)_2.12H_2O$ or of $AlK(SO_4)_2.12H_2O$.

The label of the container must indicate whether the salt is Ammonium Alum or Potassium Alum.

Description—Alum occurs as large, colorless crystals, crystalline fragments, or as a white powder. Alum is odorless, and has a sweetish, strongly astringent taste Its solutions are acid to litmus paper.

Solubility—One Gm. of Ammonium Alum dissolves in 7 cc. of water, and in about 0.3 cc. of boiling water. One Gm. of Potassium Alum dissolves in 7.5 cc. of water, and in about 0.3 cc. of boiling water. Alum is insoluble in alcohol. It is freely but slowly soluble in glycerin.

Identification—

A: Sodium hydroxide T.S. added to a solution of Ammonium Alum (1 in 20) at first produces a precipitate which completely dissolves in an excess of the reagent, ammonia being evolved.

B: Sodium hydroxide T.S. added to a solution of Potassium Alum (1 in 20) at first produces a precipitate, which completely dissolves in an excess of the reagent, but no ammonia is evolved.

C: When held in a non-luminous flame, Potassium Alum imparts to it a violet color.

D: The addition of 10 cc. of sodium bitartrate T.S. to 5 cc. of a saturated solution of Potassium Alum produces within 30 minutes a white, crystalline precipitate.

E: A solution of Alum (1 in 20) responds to the tests for *Aluminum*, page 658, and for *Sulfate*, page 663.

Alkalies and earths—Completely precipitate the aluminum from a boiling solution of 1 Gm. of Ammonium Alum in 100 cc. of water by the addition of enough ammonia T.S. to render the solution distinctly alkaline to methyl red T.S., and filter. Evaporate the filtrate to dryness, and ignite: the weight of the residue does not exceed 5 mg.

Arsenic—A solution of Alum meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Dissolve 1 Gm. of Alum in sufficient water to make 20 cc., and add 5 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 657, for Alum is 20 parts per million.

Iron—Add 5 drops of potassium ferrocyanide T.S. to 20 cc. of a solution of Alum (1 in 150): no blue color is produced immediately.

Assay—Dissolve about 1 Gm. of Alum, accurately weighed, and about 1 Gm. of ammonium chloride in 250 cc. of water. Heat the solution to boiling, and add a slight excess of ammonia T.S. to precipitate aluminum hydroxide. Collect the precipitate on a filter, wash thoroughly with hot water, dry, ignite strongly, and weigh. The weight of the aluminum oxide so obtained, multiplied by 8.894, indicates its equivalent in $AlNH_4(SO_4)_2 . 12H_2O$ and, multiplied by 9.307, indicates its equivalent in $AlK(SO_4)_2 . 12H_2O$.

Packaging and storage—Preserve Alum in well-closed containers.

Alum, Exsiccated

EXSICCATED ALUM

Alumen Exsiccatum

Alum. Exsic.—Dried Alum, Burnt Alum

$AlNH_4(SO_4)_2$	Exsiccated Ammonium Alum	Mol. wt. 237.13
$AlK(SO_4)_2$	Exsiccated Potassium Alum	Mol. wt. 258.19

Exsiccated Alum, when recently dried to constant weight at 200°, contains not less than 96.5 per cent of $AlNH_4(SO_4)_2$ or of $AlK(SO_4)_2$.

The label of the container must indicate whether the Exsiccated Alum was made from Ammonium Alum or Potassium Alum.

Description—Exsiccated Alum is a white, odorless powder. It has a sweetish, astringent taste, and absorbs moisture on exposure to air.

Solubility—One Gm. of Exsiccated Alum dissolves very slowly and usually incompletely in about 20 cc. of water. One Gm. of it dissolves in about 2 cc. of boiling water. It is insoluble in alcohol.

Identification—Exsiccated Alum responds, respectively, to the tests for *Identification* for ammonium alum or potassium alum under *Alum*, page 24.

Loss on drying—Dry about 1 Gm. of Exsiccated Alum, accurately weighed, to constant weight at 200°: its loss in weight does not exceed 10 per cent.

Water-insoluble substances—Add 2.0 Gm. of Exsiccated Alum to 40 cc. of water, and allow it to stand with occasional agitation for 24 hours. Collect the insoluble residue on previously dried, counterbalanced filter papers, or in a tared filtering crucible, wash it with 50 cc. of water, and finally dry it to constant weight at 100°: the residue weighs not more than 50 mg.

Alkalies and earths—Exsiccated Ammonium Alum meets the requirements of the test for *Alkalies and earths*, under *Alum*, page 24, allowance being made for the difference in the percentage of water present.

Arsenic, heavy metals, iron—Exsiccated Alum meets the requirements of the tests for *Arsenic*, *Heavy metals*, and *Iron* under *Alum*, page 24, allowance being made for the difference in the percentage of water present.

Assay—Dry about 500 mg. of Exsiccated Alum to constant weight at 200°, weigh accurately, and dissolve it in 100 cc. of water. Filter, if necessary, thoroughly wash the insoluble residue with water, dilute the filtrate and washings to about 250 cc. with water, and add 1 Gm. of ammonium chloride. Proceed with the assay as directed under *Alum*, page 24, beginning with the words, "Heat the solution." The weight of the aluminum oxide so obtained, multiplied by 4.652, indicates its equivalent in $AlNH_4(SO_4)_2$ and, multiplied by 5.066, its equivalent in $AlK(SO_4)_2$.

Packaging and storage—Preserve Exsiccated Alum in tight containers.

Aluminum Hydroxide Gel

ALUMINUM HYDROXIDE GEL

Gelatum Alumini Hydroxidi

Gel. Alum. Hydrox.—Colloidal Aluminum Hydroxide

Aluminum Hydroxide Gel is a suspension containing the equivalent of not less than 3.6 per cent and not more than 4.4 per cent of Al_2O_3, chiefly in the form of aluminum hydroxide.

NOTE—Sufficient peppermint oil, glycerin, sucrose, or saccharin may be added for flavoring and other purposes. Sodium benzoate or benzoic acid in an amount not exceeding 0.5 per cent may be added as a preservative.

Description—Aluminum Hydroxide Gel is a white, viscous suspension, translucent in thin layers, from which small amounts of water may separate on standing.

Identification—A solution of Aluminum Hydroxide Gel in hydrochloric acid responds to the tests for *Aluminum*, page 658.

Reaction—Aluminum Hydroxide Gel affects slightly both red and blue litmus paper, but does not affect phenolphthalein T.S.

Acid-consuming capacity—Transfer about 1.5 cc. of the well-shaken Aluminum Hydroxide Gel to a tared, 125-cc. glass-stoppered flask, and weigh. Add 50 cc. of tenth-normal hydrochloric acid, and adjust the temperature of the mixture to 37.5°. Tightly stopper the flask, and maintain at this temperature for 1 hour. Add 5 drops of bromophenol blue T.S., and titrate the excess acid with tenth-normal sodium hydroxide. Calculate the number of cc. of tenth-normal hydrochloric acid required to neutralize 1 Gm. of the Gel. The volume of tenth-normal acid consumed is not less than 12.50 cc. and not more than 25.00 cc. for each Gm. of the Gel.

Chloride—Transfer 10 Gm. of Aluminum Hydroxide Gel to a porcelain dish. Add 0.1 cc. of potassium chromate T.S. and 25 cc. of water. Stir, and add tenth-normal silver nitrate until a faint persistent pink color is obtained: it requires not more than 8 cc. of tenth-normal silver nitrate.

Sulfate—Dissolve 5 Gm. of Aluminum Hydroxide Gel in 5 cc. of diluted hydrochloric acid with the aid of heat. Cool, and dilute to 250 cc. with water. Mix well, and filter if necessary: a 20-cc. portion of the filtrate shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic—To 5 Gm. of Aluminum Hydroxide Gel add 10 cc. of diluted sulfuric acid, heat to boiling, then cool. One-half of this solution, representing 2.5 Gm. of the Gel, meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfurous acid (0.8 part per million).

Heavy metals—Dissolve 5 Gm. of Aluminum Hydroxide Gel in 10 cc. of diluted hydrochloric acid with the aid of heat, filter if necessary, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Aluminum Hydroxide Gel is 5 parts per million.

Assay—To about 5 Gm. of Aluminum Hydroxide Gel, accurately weighed, add 10 cc. of hydrochloric acid and 100 cc. of water. Heat to boiling and filter, if necessary, and wash well with hot water. Dilute the combined filtrate and washings with 75 cc. of water, add 3 drops of methyl red T.S. and sufficient ammonia T.S.

to produce a distinct yellow color. Heat to boiling, filter, and wash the precipitate with hot water until the washings are free from chloride. Dry the precipitate, ignite it to constant weight, cool and weigh the Al_2O_3 so obtained.

Packaging and storage—Preserve Aluminum Hydroxide Gel in tight containers. Do not permit it to freeze.

AVERAGE DOSE—**8 cc.** (approximately 2 fluidrachms).

Aluminum Hydroxide Gel, Dried

DRIED ALUMINUM HYDROXIDE GEL

Gelatum Alumini Hydroxidi Siccum

Gel. Alum. Hydrox. Sic.

Dried Aluminum Hydroxide Gel, when ignited to constant weight, yields not less than 50 per cent of Al_2O_3.

Description—Dried Aluminum Hydroxide Gel is a white, odorless, tasteless, amorphous powder.

Solubility—Dried Aluminum Hydroxide Gel is insoluble in water and in alcohol. It is soluble in diluted mineral acids and in solutions of fixed alkali hydroxides.

Identification—Dissolve 500 mg. of Dried Aluminum Hydroxide Gel in 10 cc. of diluted hydrochloric acid by gentle warming: the solution responds to the test for *Aluminum*, page 658.

Reaction—Agitate 1 Gm. of Dried Aluminum Hydroxide Gel with 25 cc. of water, and filter: the filtrate is neutral to litmus paper.

Acid-consuming capacity—Weigh accurately from 200 to 250 mg. of Dried Aluminum Hydroxide Gel, and transfer it completely to a 250-cc. flask. Add exactly 100 cc. of tenth-normal hydrochloric acid, and shake the mixture continuously at 37.5° for 1 hour. Then titrate the excess of acid in exactly 50 cc. of the solution with tenth-normal sodium hydroxide, using bromophenol blue T.S. as the indicator: the volume of tenth-normal acid consumed is not less than 250 cc. for each Gm. of Dried Aluminum Hydroxide Gel.

Chloride—Dissolve 1 Gm. of Dried Aluminum Hydroxide Gel in 30 cc. of diluted nitric acid, heat to boiling, add sufficient water to make 100 cc., and filter. A 5-cc. portion of the filtrate, diluted with an equal volume of water, shows no more *Chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—Dissolve 1 Gm. of Dried Aluminum Hydroxide Gel in 15 cc. of diluted hydrochloric acid, heat to boiling, add sufficient water to make 250 cc., and filter. A 25-cc. portion of the filtrate shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic and heavy metals—Dried Aluminum Hydroxide Gel meets the requirements of the tests for *Arsenic* and for *Heavy metals* under *Aluminum Hydroxide Gel*, page 26, allowance being made for the difference in Al_2O_3 content.

Assay—Dissolve about 500 mg. of Dried Aluminum Hydroxide Gel, accurately weighed, by heating with just sufficient diluted hydrochloric acid to bring the aluminum hydroxide into solution. Add 50 cc. of water, filter, and wash well with hot water. Dilute the combined filtrate and washings with water to about 200 cc., add 3 drops of methyl red T.S. and sufficient ammonia T.S. to produce a distinct yellow color. Heat to boiling, filter, and wash the precipitate, with hot water until the washings are free from chloride. Dry the precipitate, ignite it to constant weight, cool and weigh the Al_2O_3 so obtained.

Packaging and storage—Preserve Dried Aluminum Hydroxide Gel in tight containers.

AVERAGE DOSE—**0.6 Gm.** (approximately 10 grains).

Aluminum Phosphate Gel

ALUMINUM PHOSPHATE GEL

Gelatum Alumini Phosphatis

Gel. Alum. Phos.

Aluminum Phosphate Gel is a water suspension containing not less than 3.8 per cent and not more than 4.5 per cent of $AlPO_4$.

NOTE—Sufficient peppermint oil, glycerin, sucrose, or saccharin may be added for flavoring and other purposes. Sodium benzoate or benzoic acid in an amount not exceeding 0.5 per cent may be added as a preservative.

Description—Aluminum Phosphate Gel is a white, viscous suspension from which small amounts of water may separate on standing.

Identification—

A: A solution of Aluminum Phosphate Gel in hydrochloric acid responds to the tests for *Aluminum*, page 658.

B: A solution of Aluminum Phosphate Gel in diluted nitric acid responds to the tests for *Phosphate*, page, 662.

pH—The pH of Aluminum Phosphate Gel at 25° is between 6.0 and 7.2.

Reaction rate—Add 30 cc. of tenth-normal hydrochloric acid to 6 Gm. of Aluminum Phosphate Gel, and heat at 37° for 15 minutes: the pH of the mixture is between 2.0 and 2.5.

Chloride—Transfer 25 Gm. of Aluminum Phosphate Gel to a beaker with the aid of about 50 cc. of water, add 5 cc. of nitric acid, mix well, then add, with stirring, 30 cc. of tenth-normal silver nitrate. Warm on a steam bath for 30 minutes, filter, wash the precipitate with water acidulated with nitric acid, then titrate the excess silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 3.546 mg. of Cl. The chloride (Cl) content does not exceed 1.6 mg. per 1 Gm. of Aluminum Phosphate Gel.

Soluble Phosphate—Filter 20 Gm. of Aluminum Phosphate Gel, and wash the residue with 30 cc. of water. Add to the filtrate 2 cc. of nitric acid, heat to 60°, and add 20 cc. of ammonium molybdate T.S. Heat at 60° for 30 minutes, filter, wash the precipitate with a mixture of 1 volume of nitric acid and 35 volumes of water, and then with 1 per cent potassium nitrate solution until the filtrate is no longer acid. Dissolve the precipitate in exactly 15 cc. of tenth-normal sodium hydroxide, and titrate the excess alkali with tenth-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is equivalent to 0.414 mg. of PO_4. The soluble phosphate, calculated as PO_4, is not greater than 0.07 per cent.

Sulfate—Add 10 cc. of diluted hydrochloric acid to 10 Gm. of Aluminum Phosphate Gel, and heat to boiling. Cool, dilute to 250 cc., and filter if necessary. A 10-cc. portion of the solution shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic—Dissolve 2.5 Gm. of Aluminum Phosphate Gel in 5 cc. of diluted hydrochloric acid. The solution, omitting the preliminary treatment with sulfuric and sulfurous acids, meets the requirements of the test for *Arsenic*, page 618 (0.8 part per million).

Heavy metals—Dissolve 10 Gm. of Aluminum Phosphate Gel in 2.5 cc. of diluted hydrochloric acid, warming if necessary, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Aluminum Phosphate Gel is 5 parts per million.

Neutralizing value—To about 250 mg. of Aluminum Phosphate Gel, accurately weighed, add 1 drop of thymol blue T.S. and 30 cc. of tenth-normal hydrochloric

acid, and digest at 37° for 30 minutes. Titrate the excess acid with tenth-normal sodium hydroxide to pH 2.5, as shown by the thymol blue T.S. Color comparison may be made by adding thymol blue T.S. to a standard buffer solution, pH 2.5 ± 0.1, and using this color to match the end-point of the titration. Each Gm. of the Gel requires not less than 5 and not more than 9 cc. of tenth-normal hydrochloric acid for neutralization.

Assay—To about 20 Gm. of Aluminum Phosphate Gel, accurately weighed in a 100-cc. volumetric flask, add nitric acid until solution is complete, dilute with water to the mark, and mix thoroughly. Transfer exactly 10 cc. of the solution to a 400-cc. beaker, dilute with water to 100 cc., heat to 60°, add an excess of ammonium molybdate T.S., and heat at 60° on a steam bath for 30 minutes. Filter, wash the precipitate with a mixture of 1 volume of nitric acid and 35 volumes of water, followed by a 1 per cent solution of potassium nitrate, until the filtrate is no longer acid. Dissolve the precipitate in exactly 50 cc. of half-normal sodium hydroxide, and titrate the excess of sodium hydroxide with half normal sulfuric acid, using phenolphthalein T.S. as the indicator. Each cc. of half-normal sodium hydroxide is equivalent to 2.654 mg. of $AlPO_4$.

Packaging and storage—Preserve Aluminum Phosphate Gel in tight containers.

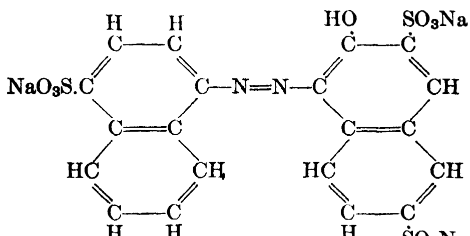
AVERAGE DOSE—8 cc. (approximately 2 fluidrachms).

Amaranth

AMARANTH

Amaranthum

Amaranth.—F. D. and C. Red No. 2



$C_{20}H_{11}N_2O_{10}Na_3S_3$ Mol. wt. 604.48

Description—Amaranth occurs as a dark, red brown powder.

Solubility—One Gm. of Amaranth dissolves in about 15 cc. of water; it is very slightly soluble in alcohol.

Color—The color of a solution of Amaranth (1 in 100) when viewed through a depth of 1 cm. is vivid red. The color of this solution is not appreciably changed by the addition of hydrochloric acid; sodium hydroxide T.S. intensifies the color.

Standard—Amaranth complies with the specification for F. D. and C. Red No. 2 as listed in the Coal-Tar Color Regulations promulgated under the authority of the Food, Drug and Cosmetic Act.

Packaging and storage—Preserve Amaranth in well-closed containers.

Amaranth Solution

AMARANTH SOLUTION

Liquor Amaranthi

Liq. Amaranth.

AMARANTH	**1 Gm.**
DISTILLED WATER, a sufficient quantity,	
To make	100 cc.

Dissolve the amaranth in sufficient distilled water to make the finished product measure 100 cc.

Description—Amaranth Solution is a clear, vivid red liquid, with but a slight odor.

Residue—Evaporate 10 cc. of Amaranth Solution on a water bath, and dry to constant weight at 100°: the weight of the residue is not less than 90 mg. and not more than 110 mg. The residue complies with the requirements for *Amaranth*, page 29.

Packaging and storage—Preserve Amaranth Solution in tight, light-resistant containers.

Aminophylline

AMINOPHYLLINE

Aminophyllina

Aminophyl.—Theophylline Ethylenediamine U. S. P. XII

$C_{16}H_{24}N_{10}O_4.2H_2O$ $(C_7H_8N_4O_2)_2C_2H_4(NH_2)_2.2H_2O$ Mol. wt. 456.46

Aminophylline contains not less than 75 per cent and not more than 82 per cent of anhydrous theophylline ($C_7H_8N_4O_2$), and not less than 12.3 per cent and not more than 13.8 per cent of ethylenediamine $[C_2H_4(NH_2)_2]$.

Description—Aminophylline occurs as white or slightly yellowish granules or powder, possessing a slight ammoniacal odor and a bitter taste. It gradually absorbs carbon dioxide from the air with the liberation of free theophylline. Its solutions are alkaline to litmus paper.

Solubility—One Gm. of Aminophylline dissolves in about 5 cc. of water, but the solution may become turbid on standing. It is insoluble in alcohol and in ether.

Identification—

A: Dissolve about 1 Gm. of Aminophylline in 20 cc. of water, add, with constant stirring, 1 cc. of diluted hydrochloric acid, filter, wash the precipitate with small portions of cold water, and dry it at 100°: the dried precipitate responds to the *Identification tests A* and *B* under *Theophylline*, page 565.

B: The dried precipitate of theophylline from test *A* melts between 270° and 274°, page 685.

Residue on ignition—Aminophylline yields not more than 0.15 per cent of residue on ignition, page 685.

Assay for theophylline—Place about 250 mg. of Aminophylline, accurately weighed, in a 250-cc. Erlenmeyer flask, add 50 cc. of water and 8 cc. of ammonia T.S., and gently warm the mixture on a steam bath until complete solution is effected. Add exactly 20 cc. of tenth-normal silver nitrate, mix, and continue to warm on the bath for 15 minutes. Filter through a filtering crucible under reduced pressure while still warm, and wash the precipitate three times with 10-cc. portions of water. Acidify the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric-ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 18.02 mg. of $C_7H_8N_4O_2$.

Assay for ethylenediamine—Dissolve about 500 mg. of Aminophylline, accurately weighed, in 30 cc. of water. Add a few drops of methyl orange T.S., and titrate with tenth-normal hydrochloric acid. Each cc. of the tenth-normal acid is equivalent to 3.005 mg. of $C_2H_4(NH_2)_2$.

Packaging and storage—Preserve Aminophylline in tight containers.

AVERAGE DOSE—

Oral, **0.2 Gm.** (approximately 3 grains).

Intramuscular or intravenous, **0.25 Gm.** (approximately 4 grains).

Aminophylline Injection

AMINOPHYLLINE INJECTION

Injectio Aminophyllinæ

Inj. Aminophyl.—Theophylline Ethylenediamine Injection U. S. P. XII

Aminophylline Injection is a sterile solution of aminophylline in water for injection. It contains an amount of anhydrous theophylline ($C_7H_8N_4O_2$) equivalent to not less than 73 per cent and not more than 83 per cent of the labeled amount of aminophylline ($C_{16}H_{24}N_{10}O_4.2H_2O$). It meets the requirements of the *Sterility Test for Liquids*, page 689. For the purpose of stabilization, the Injection may contain added ethylenediamine amounting to not more than 60 mg. of $C_2H_4(NH_2)_2$ for each 1 Gm. of aminophylline.

Sterilize Aminophylline Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Dilute a volume of the Injection, equivalent to about 500 mg. of aminophylline, with water to about 25 cc., and add, with constant stirring, 1 cc. of diluted hydrochloric acid or enough to precipitate the theophylline completely. Filter, wash the precipitate with a small portion of cold water, and dry at about 100°: the theophylline so obtained melts between 270° and 274° and responds to the *Identification tests A* and *B* under *Theophylline*, page 565.

Assay for theophylline—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injections in Containers*, page 665, with water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 300 mg. of aminophylline, to a 250-cc. Erlenmeyer flask, and add sufficient water to make the volume measure about 25 cc. Add 8 cc. of ammonia T.S., then add exactly 20 cc. of tenth-normal silver nitrate, and heat on a steam bath for 15 minutes. Filter through a filtering crucible under reduced pressure, and wash the precipitate three times with 10-cc. portions of water. Neutralize the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool; add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 18.02 mg. of $C_7H_8N_4O_2$.

Assay for ethylenediamine—Accurately measure a volume of the Injection, equivalent to about 500 mg. of aminophylline, and dilute it, if necessary, with water to about 30 cc. Add a few drops of methyl orange T.S., and titrate with tenth-normal hydrochloric acid. Each cc. of tenth-normal acid is equivalent to 3.005 mg. of $C_2H_4(NH_2)_2$.

Packaging and storage—Preserve Aminophylline Injection preferably in single-dose hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Aminophylline Injection usually available contains the following amounts of aminophylline: 250 mg. (4 grains) in 10 cc.; 500 mg. (7½ grains) in 2 cc.; 500 mg. (7½ grains) in 20 cc.

AVERAGE DOSE OF AMINOPHYLLINE—Intramuscular or intravenous, **0.25 Gm.** (approximately 4 grains).

Aminophylline Tablets

AMINOPHYLLINE TABLETS

Tabellæ Aminophyllinæ

Tab. Aminophyl.—Theophylline Ethylenediamine Tablets U. S. P. XII

Aminophylline Tablets contain an amount of anhydrous theophylline ($C_7H_8N_4O_2$) equivalent to not less than 73 per cent and not more than 84 per cent of the labeled amount of aminophylline ($C_{16}H_{24}N_{10}O_4.2H_2O$).

Identification—Macerate a quantity of Aminophylline Tablets, equivalent to about 500 mg. of aminophylline, with 25 cc. of water, and filter: the filtrate is alkaline to litmus. Add to the filtrate 1 cc. of diluted hydrochloric acid: a precipitate of theophylline is formed. Collect the precipitate on a filter, wash it well with small portions of cold water, and dry at about 100°. The theophylline so obtained, responds to *Identification tests A* and *B* under *Theophylline*, page 565, and when recrystallized from hot water and dried at 100°, melts between 270° and 274°, page 667.

Assay—Crush 20 Aminophylline Tablets without an appreciable loss, and transfer completely to a 200-cc. flask with the aid of a mixture of 50 cc. of water and 15 cc. of ammonia T.S., and allow to stand for 30 minutes with frequent shaking. Dilute to 200 cc. with water, mix well, and filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer an accurately measured aliquot, equivalent to about 300 mg. of aminophylline, to a 250-cc. Erlenmeyer flask, and add 8 cc. of ammonia T.S. and exactly 20 cc. of tenth-normal silver nitrate. Heat on a steam bath for 15 minutes, then filter through a filtering crucible under reduced pressure, and wash the precipitate three times with 10-cc. portions of water.

Acidify the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 18.02 mg. of $C_7H_8N_4O_2$.

Packaging and storage—Preserve Aminophylline Tablets in tight containers.

Sizes—Aminophylline Tablets usually available contain the following amounts of Aminophylline: 100 and 200 mg. (1½ and 3 grains).

AVERAGE DOSE OF AMINOPHYLLINE—**0.2 Gm.** (approximately 3 grains).

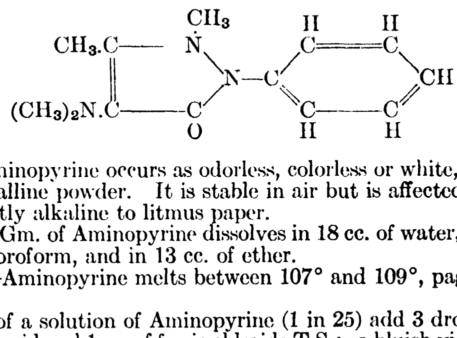
Aminopyrine

AMINOPYRINE

Aminopyrina

Aminopyrin.—Amidopyrine

$C_{13}H_{17}N_3O$



Mol. wt. 231.29

Description—Aminopyrine occurs as odorless, colorless or white, small crystals, or as a white, crystalline powder. It is stable in air but is affected by light. Its solutions are slightly alkaline to litmus paper.

Solubility—One Gm. of Aminopyrine dissolves in 18 cc. of water, in 1.5 cc. of alcohol, in 1 cc. of chloroform, and in 13 cc. of ether.

Melting range—Aminopyrine melts between 107° and 109°, page 667.

Identification—

A: To 5 cc. of a solution of Aminopyrine (1 in 25) add 3 drops of diluted hydrochloric acid and 1 cc. of ferric chloride T.S.: a bluish violet color is produced in the mixture. On the subsequent addition of a few drops of diluted sulfuric acid, the color changes to violet red.

B: To 5 cc. of a solution of Aminopyrine (1 in 25) add 5 drops of silver nitrate T.S.: a deep violet color is produced. The mixture develops a grayish black precipitate of metallic silver on standing.

C: A solution of Aminopyrine (1 in 25) added to a freshly prepared solution of potassium ferricyanide T.S., containing a little ferric chloride, produces at once a dark blue color or precipitate (difference from *antipyrine*).

Loss on drying—When dried over sulfuric acid for 3 hours, Aminopyrine loses not more than 1 per cent of its weight.

Residue on ignition—Aminopyrine yields not more than 0.15 per cent of residue on ignition, page 685.

Chloride—Acidify 5 cc. of a solution of Aminopyrine (1 in 25) with 1 cc. of diluted nitric acid and add a few drops of silver nitrate T.S.: a purple color may develop but no turbidity is produced at once.

Heavy metals—Dissolve 1 Gm. of Aminopyrine in 2 cc. of diluted acetic acid and sufficient water to make 25 cc.: the heavy metals limit, page 657, for Aminopyrine is 20 parts per million.

Readily carbonizable substances—Dissolve 100 mg. of Aminopyrine in 1 cc. of sulfuric acid: the solution is colorless, page 680.

Antipyrine—To 100 mg. of Aminopyrine add 100 mg. of vanillin, 5 cc. of water, and 2 cc. of sulfuric acid, and heat the mixture to boiling: no more color is developed than is obtained by adding 5 cc. of water and 2 cc. of sulfuric acid to 100 mg. of vanillin and heating the mixture to boiling.

Packaging and storage—Preserve Aminopyrine in well-closed, light-resistant containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Aminopyrine Tablets

AMINOPYRINE TABLETS

Tabellæ Aminopyrinæ

Tab. Aminopyrin.—Amidopyrine Tablets

Aminopyrine Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $C_{13}H_{17}N_3O$.

Identification—Prepare a filtered solution of Aminopyrine Tablets containing about 4 per cent of aminopyrine. The solution responds to the *Identification tests* under *Aminopyrine*, page 33. The aminopyrine obtained in the assay melts between 106° and 109°.

Assay—Weigh a counted number of not less than 20 of the Tablets and reduce them to a fine powder without appreciable loss. Transfer an accurately weighed portion of the powder, equivalent to about 1 Gm. of aminopyrine, to a 100-cc. volumetric flask. Add 60 cc. of normal hydrochloric acid and shake until no more dissolves. Fill the flask to the 100-cc. mark with normal hydrochloric acid, mix well, and filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer exactly 25 cc. of the subsequent filtrate to a separator, render distinctly alkaline with ammonia T.S., and completely extract the aminopyrine, using 25 cc., then four or more 15-cc. portions of chloroform. To determine the completeness of extraction, evaporate 5 cc. of the last chloroform extract to dryness on a steam bath: the weight of the residue does not exceed 0.5 mg. Wash the combined chloroform extracts with 5 cc. of water, and re-extract the water washing with 5 cc. of chloroform, adding the latter to the main chloroform extract. Filter the combined chloroform solutions through a filter paper moistened with chloroform, and wash the separator and filter with two 5-cc. portions of chloroform. Evaporate the chloroform on a steam bath with the aid of a current of air, dry the residue of aminopyrine at 100° for 15 minutes, cool, and weigh.

Packaging and storage—Preserve Aminopyrine Tablets in well-closed, light-resistant containers.

Sizes—Aminopyrine Tablets usually available contain the following amount of aminopyrine: 0.3 Gm. (5 grains).

AVERAGE DOSE OF AMINOPYRINE—**0.3 Gm.** (approximately 5 grains).

Ammonia Solution, Diluted

DILUTED AMMONIA SOLUTION

Liquor Ammoniæ Dilutus

Liq. Ammon. Dil.—Ammonia Water, Diluted Ammonium Hydroxide Solution

Diluted Ammonia Solution is a solution of NH_3 containing, in each 100 cc., not less than 9 Gm. and not more than 10 Gm. of NH_3. This solution deteriorates rapidly in open containers.

Diluted Ammonia Solution may be prepared as follows:

STRONG AMMONIA SOLUTION..........................	398 cc.
DISTILLED WATER, a sufficient quantity,	
To make............................	1000 cc.

Mix the ingredients.

Description—Diluted Ammonia Solution is a colorless, transparent liquid, having a very pungent, characteristic odor. It is strongly alkaline to litmus paper. Its specific gravity is about 0.96.

Identification—Dense, white fumes are produced if a glass rod wet with hydrochloric acid is held near the surface of Diluted Ammonia Solution.

Non-volatile substances—A 10-cc. portion of Diluted Ammonia Solution, evaporated to dryness in a platinum or porcelain dish and dried to constant weight at 120°, leaves not more than 2 mg. of residue.

Heavy metals—Evaporate 5 cc. of Diluted Ammonia Solution to dryness on a water bath, add to the residue 1 cc. of diluted hydrochloric acid, and evaporate to dryness. Dissolve in the residue 2 cc. of diluted acetic acid and 23 cc. of water: the heavy metals limit, page 657, for Diluted Ammonia Solution is 5 parts per million.

Readily oxidizable substances—To 10 cc. of Diluted Ammonia Solution add a slight excess of diluted sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate: the pink color does not completely disappear in 10 minutes.

Assay—Transfer 5 cc. of Diluted Ammonia Solution, accurately measured, to a suitable flask containing about 25 cc. of water, and titrate with normal sulfuric acid, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 17.03 mg. of NH_3.

Packaging and storage—Preserve Diluted Ammonia Solution in tight containers, preferably at a temperature not above 30°.

Ammonia Solution, Strong

STRONG AMMONIA SOLUTION

Liquor Ammoniæ Fortis

Liq. Ammon. Fort.—Stronger Ammonia Water, Stronger Ammonium Hydroxide Solution

Strong Ammonia Solution is a solution of NH_3, containing not less than 27 per cent and not more than 29 per cent of NH_3. This solution deteriorates rapidly in open containers.

Caution—Great care should be used in handling Strong Ammonia Solution because of the caustic and irritating properties of its vapor. Before the container is opened it should be well cooled and the closure covered with a towel before removal. Strong Ammonia Solution must never be tasted nor its vapor inhaled.

Description—Strong Ammonia Solution is a colorless, transparent liquid, having an exceedingly pungent, characteristic odor, and a very caustic and alkaline taste. It is strongly alkaline to litmus paper. Its specific gravity is about 0.90.

Other tests—Strong Ammonia Solution, diluted with one and one half times its volume of water, conforms to the tests for *Non-volatile substances*, *Heavy metals*, and *Readily oxidizable substances* under *Diluted Ammonia Solution*, page 35.

Assay—Accurately weigh a glass-stoppered flask containing about 25 cc. of water, add about 2 cc. of Strong Ammonia Solution, stopper, and weigh again. Titrate with normal sulfuric acid, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 17.03 mg. of NH_3.

Packaging and storage—Preserve Strong Ammonia Solution in tight containers, preferably at a temperature not above 25°.

Ammonia Spirit, Aromatic

AROMATIC AMMONIA SPIRIT

Spiritus Ammoniæ Aromaticus

Sp. Ammon. Arom.

Aromatic Ammonia Spirit contains, in each 100 cc., not less than 1.7 Gm. and not more than 2.1 Gm. of total NH_3, and ammonium carbonate, corresponding to not less than 3.5 Gm. and not more than 4.5 Gm. of $(NH_4)_2CO_3$.

Ammonium Carbonate, in translucent pieces	34 Gm.
Diluted Ammonia Solution	90 cc.
Lemon Oil	10 cc.
Lavender Oil	1 cc.
Myristica Oil	1 cc.
Alcohol	700 cc.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Dissolve the ammonium carbonate in the diluted ammonia solution and 140 cc. of distilled water by gentle agitation, and allow the solution to stand for 12 hours. Dissolve the oils in the alcohol, contained in a graduated bottle or cylinder, and gradually add the ammonium carbonate solution and enough distilled water to make the product measure

1000 cc. Set it aside in a cool place for 24 hours, occasionally agitating the mixture, and then filter, using a covered funnel.

Description—Aromatic Ammonia Spirit is a nearly colorless liquid when recently prepared, but gradually acquires a yellow color on standing. It has the taste of ammonia, an aromatic and pungent odor, and is affected by light. Its specific gravity is about 0.90.

Assay for total NH_3—Measure accurately 10 cc. of Aromatic Ammonia Spirit and transfer it to a 250-cc. Erlenmeyer flask containing about 50 cc. of water. Add exactly 30 cc. of half-normal sulfuric acid, and boil until the solution becomes clear. Cool, and titrate the excess of acid with half-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of half-normal sulfuric acid is equivalent to 8.516 mg. of NH_3.

Assay for ammonium carbonate—Transfer another 10-cc. portion of Aromatic Ammonia Spirit, accurately measured, to a flask of about 300-cc. capacity. Add about 30 cc. of half-normal sodium hydroxide, and boil the mixture, replacing the water lost by evaporation, until the vapors no longer turn moist red litmus paper blue. Cool, dilute with 100 cc. of cold, carbon dioxide-free water, add about 6 drops of phenolphthalein T.S., and then just enough half-normal sulfuric acid to discharge the color of the phenolphthalein. Now add about 3 drops of methyl orange T.S., and titrate with half-normal sulfuric acid. Each cc. of half-normal sulfuric acid consumed in the titration with methyl orange T.S. is equivalent to 48.05 mg. of $(NH_4)_2CO_3$.

Alcohol content—From 62 to 68 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Aromatic Ammonia Spirit in tight, light-resistant containers, preferably at a temperature not above 30°.

AVERAGE DOSE—2 cc. (approximately 30 minims).

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Ammoniated Mercury Ointment .. 314

Ammonium Carbonate

AMMONIUM CARBONATE

Ammonii Carbonas

Ammon. Carb.

Ammonium Carbonate consists of ammonium acid carbonate (NH_4HCO_3) and ammonium carbamate ($NH_2.COO.NH_4$) in varying proportions, and yields not less than 30 per cent and not more than 33 per cent of NH_3.

Description—Ammonium Carbonate occurs in hard, white or translucent masses, having a strong odor of ammonia, without empyreuma, and with a sharp, ammoniacal taste. It is affected by light. Its solution is alkaline to litmus paper. On exposure to air, it loses ammonia and carbon dioxide, becoming opaque, and is finally converted into friable, porous lumps or a white powder.

Solubility—One Gm. of Ammonium Carbonate dissolves very slowly in about 4 cc. of water. It is decomposed by hot water.

Identification—When heated, Ammonium Carbonate is volatilized without charring, and the vapor is strongly alkaline to moistened litmus paper. A solution of Ammonium Carbonate (1 in 20) effervesces with acids.

Residue on ignition—Ammonium Carbonate yields not more than 0.05 per cent of residue on ignition.

Chloride—A 2-Gm. portion of Ammonium Carbonate shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 2-Gm. portion of Ammonium Carbonate shows no more *Sulfate* than corresponds to 0.1 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Reduce Ammonium Carbonate to a coarse powder, and volatilize 2 Gm. of it on a water bath. Add to the residue 1 cc. of diluted hydrochloric acid, and evaporate to dryness. Dissolve the residue in 2 cc. of diluted acetic acid, and add sufficient water to measure 25 cc.: the heavy metals limit, page 657, for Ammonium Carbonate is 10 parts per million.

Empyreumatic matter—Add a slight excess of nitric acid to a solution containing 1 Gm. of Ammonium Carbonate, and evaporate to dryness on a water bath: a colorless, odorless residue is obtained.

Assay—Place in a weighing bottle about 10 cc. of water, tare the bottle and its contents, add about 2 Gm. of Ammonium Carbonate, and weigh accurately. Transfer the contents of the bottle to a 250-cc. flask, add 50 cc. of normal sulfuric acid, and, when solution has been effected, titrate the excess of acid with normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 17.03 mg. of NH_3.

Packaging and storage—Preserve Ammonium Carbonate in tight containers, preferably at a temperature not above 30°, protected from light.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Ammonium Chloride

AMMONIUM CHLORIDE

Ammonii Chloridum

Ammon. Chlorid.—Muriate of Ammonia

NH_4Cl Mol. wt. 53.50

Ammonium Chloride, when dried over sulfuric acid for 4 hours, contains not less than 99.5 per cent of NH_4Cl.

Description—Ammonium Chloride occurs as colorless crystals or as a white, fine or coarse, crystalline powder. It has a cool, saline taste, and is somewhat hygroscopic.

Solubility—One Gm. of Ammonium Chloride dissolves in 2.6 cc. of water, in about 100 cc. of alcohol, and in about 8 cc. of glycerin. One Gm. of it dissolves in 1.4 cc. of boiling water.

Identification—A solution of the salt (1 in 10) responds to the tests for *Ammonium*, page 658, and for *Chloride*, page 659.

Loss on drying—When dried over sulfuric acid for 4 hours, Ammonium Chloride loses not more than 0.5 per cent of its weight.

Residue on ignition—Add 1 cc. of sulfuric acid to about 2 Gm. of the salt, accurately weighed, and heat the mixture gently until volatilization is complete. The residue is white, and when ignited leaves not more than 0.1 per cent of non-volatile substances.

Free acid—Dissolve 2 Gm. of Ammonium Chloride in 20 cc. of cold water, and add 1 drop of methyl red T.S. If a pink color is produced, the addition of not more than 0.05 cc. of tenth-normal sodium hydroxide is required to change the color to yellow.
Thiocyanate—Acidify 10 cc. of a solution of Ammonium Chloride (1 in 10) with hydrochloric acid and add a few drops of ferric chloride T.S.: the mixture does not become red.
Heavy metals—Dissolve 2 Gm. of Ammonium Chloride in 2 cc. of diluted acetic acid and sufficient water to make 25 cc.: the heavy metals limit, page 657, for Ammonium Chloride is 10 parts per million.
Assay—Dry about 200 mg. of Ammonium Chloride over sulfuric acid for 4 hours, weigh accurately, and dissolve it in about 40 cc. of water, in a glass-stoppered flask. Add 50 cc. of tenth-normal silver nitrate, 3 cc. of nitric acid, 3 cc. of nitrobenzene, shake vigorously, and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric-ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 5.350 mg. of NH_4Cl.
Packaging and storage—Preserve Ammonium Chloride in tight containers.

AVERAGE DOSE—

Expectorant, single dose, **0.3 Gm.** (approximately 5 grains).
Diuretic, daily dose, **4 Gm.** (approximately 60 grains).

Ammonium Chloride Capsules

AMMONIUM CHLORIDE CAPSULES

Capsulæ Ammonii Chloridi

Cap. Ammon. Chlorid.

Ammonium Chloride Capsules contain not less than 93 per cent and not more than 107 per cent of the labeled amount of NH_4Cl.

Identification—Dissolve the contents of a sufficient number of Ammonium Chloride Capsules in water to yield 20 cc. of a 1 in 50 solution. This solution responds to the tests for *Ammonium*, page 658, and for *Chloride*, page 659.
Assay—Transfer as completely as possible the contents of a counted number of not less than 20 Ammonium Chloride Capsules to a 500-cc. volumetric flask. Place the emptied capsules in a beaker, add sufficient cold water to cover them, and agitate for 5 minutes. Filter into the flask, wash the beaker and the filter well with cold water, receiving the washings in the same flask, then add water to make exactly 500 cc., and mix well. Transfer an accurately measured aliquot of the solution, equivalent to about 200 mg. of ammonium chloride, to a distilling flask connected with a distillation trap to a well-cooled condenser which dips into a vessel containing 50 cc. of tenth-normal sulfuric acid, accurately measured. Add to the flask 150 cc. of water and 20 cc. of 10 per cent sodium hydroxide solution, and distil over about 150 cc. Then titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 5.350 mg. of NH_4Cl.

Sizes—Ammonium Chloride Capsules usually available contain the following amounts of ammonium chloride: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DAILY DOSAGE OF AMMONIUM CHLORIDE—Diuretic—
4 Gm. (approximately 60 grains).

Amyl Nitrite

AMYL NITRITE

Amylis Nitris

Amyl. Nitris—Isoamyl Nitrite

$C_5H_{11}NO_2$ $CH_3.CH.(CH_3).CH_2\ CH_2NO_2$ Mol. wt. 117.15

Amyl Nitrite contains not less than 90 per cent of $C_5H_{11}NO_2$.

Description—Amyl Nitrite is a clear, yellowish liquid, having a peculiar, ethereal, fruity odor, and a pungent, aromatic taste. It is volatile even at low temperatures and is inflammable.

Solubility—Amyl Nitrite is almost insoluble in water, but is miscible with alcohol and with ether.

Specific gravity—The specific gravity of Amyl Nitrite is not less than 0.865 and not more than 0.875.

Identification—

A: Add 2 cc. of sulfuric acid to a mixture of 2 drops of Amyl Nitrite and 2 drops of water: when diluted with water, amyl valerate is produced, recognized by its odor.

B: Add a few drops of Amyl Nitrite to a mixture of 1 cc. of ferrous sulfate T.S. and 5 cc. of diluted hydrochloric acid: a greenish brown color is produced.

Acid—Mix 1 cc. of normal sodium hydroxide and 10 cc. of water with a drop of phenolphthalein T.S. in a glass-stoppered cylinder, and add 5 cc. of Amyl Nitrite. After the cylinder is inverted three times, the red tint of the water layer is still perceptible.

Aldehyde—To a mixture of 1.5 cc. of silver nitrate T.S. and 1.5 cc. of aldehyde-free alcohol add ammonia T.S., dropwise, until the precipitate first formed is redissolved. Then add 1 cc. of Amyl Nitrite, and gently heat for 1 minute: the mixture does not become brown or black.

Assay—Transfer about 3 cc. of Amyl Nitrite, previously shaken with 500-mg. of anhydrous potassium carbonate and carefully decanted, to a 100-cc. flask, tared with about 20 cc. of alcohol, and weigh accurately. Add sufficient alcohol to bring the volume to exactly 100 cc., and mix thoroughly. Introduce into the funnel top of a nitrometer, which has previously been filled with a saturated solution of sodium chloride, exactly 10 cc. of the alcohol solution, and after drawing this into the measuring tube of the nitrometer without the admission of air, follow it with 5 cc. of alcohol as a rinse, then with 10 cc. of potassium iodide T.S., and afterwards with 5 cc. of diluted sulfuric acid, introducing each reagent separately into the measuring tube. When the volume of gas has become constant (in about 30 to 60 minutes), note the amount collected and also the temperature at the nitrometer as well as the barometric pressure. Multiply the volume of gas in cc. by 4.8, and divide the product by the weight of the Amyl Nitrite taken. At 25° and 760 mm. pressure, the quotient represents the percentage of $C_5H_{11}NO_2$ in the liquid. The temperature correction is $\frac{1}{273}$ of the total percentage just found for each degree, added if the temperature is below 25°, and subtracted if it is above 25°. The baro-

metric correction is $\frac{1}{60}$ of the total percentage just found for each mm., added if it is above 760 mm., and subtracted if it is below 760 mm.
Packaging and storage—Preserve Amyl Nitrite in tight containers.

AVERAGE DOSE—Inhalation, 0.2 cc. (approximately 3 minims).

AMYLENE HYDRATE

Amyleni Hydras

Amylen. Hydr.—Tertiary Amyl Alcohol

$C_5H_{12}O$ $C_2H_5.C(CH_3)_2.OH$ Mol. wt. 88.15

Description—Amylene Hydrate occurs as a clear, colorless liquid, having a camphoraceous odor, and a burning taste. Its solutions are neutral to litmus paper.
Solubility—One Gm. of Amylene Hydrate dissolves in about 8 cc. of water. It is miscible with alcohol, with chloroform, with ether, and with glycerin.
Specific gravity—The specific gravity of Amylene Hydrate is not less than 0.803 and not more than 0.807.
Boiling range—Amylene Hydrate boils between 97° and 103°, page 624.
Identification—

A: Mix 2 cc. of Amylene Hydrate with 15 cc. of water, 5 cc. of sulfuric acid, and 10 Gm. of potassium dichromate, and heat the mixture under a reflux condenser for 2 hours, then distil the mixture, collecting and reserving the first 2 cc. of the distillate. Continue the distillation until most of the water has distilled over, make this distillate alkaline with sodium hydroxide T.S., add diluted sulfuric acid, dropwise, until the solution is neutral to litmus paper, and carefully evaporate to dryness: the residue responds to the tests for *Acetate*, page 658.

B: Mix 1 cc. of the first 2 cc. of the distillate, obtained in *Identification test A*, with 200 cc. of water. To 1 cc. of the dilution add 5 drops of sodium nitroferricyanide T.S., 2 cc. of sodium hydroxide T.S., then a slight excess of acetic acid: a deep red liquid is produced which develops a violet tint when diluted with several volumes of water.

C: To 10 cc. of a solution of Amylene Hydrate (1 in 10) quickly add 5 cc. of a solution of vanillin in sulfuric acid (1 in 100): a violet red color is produced.

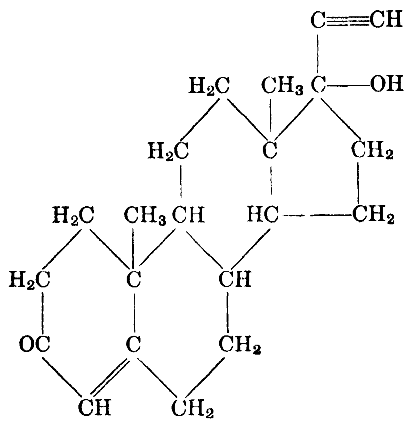
Water—To 10 cc. of Amylene Hydrate add 1 Gm. of anhydrous cupric sulfate and shake well: the cupric sulfate does not become blue.
Non-volatile residue—Evaporate 20 cc. of Amylene Hydrate in a porcelain dish on a water bath to a volume of about 2 cc., and then allow it to evaporate spontaneously to dryness: the residue, if any, is colorless, and when dried at 100° for 2 hours, weighs not more than 50 mg.
Heavy metals—Evaporate 2.5 cc. (2 Gm.) of Amylene Hydrate to dryness on a steam bath, warm the residue gently with 1 cc. of tenth-normal hydrochloric acid, dilute to a volume of 25 cc. with water, and filter if necessary: the heavy metals limit, page 657, for Amylene Hydrate is 5 parts per million.
Readily oxidizable substances—To 10 cc. of a solution of Amylene Hydrate (1 in 20) add 0.1 cc. of tenth-normal potassium permanganate: the pink color is not entirely discharged within 10 minutes.
Aldehyde—To 10 cc. of a solution of Amylene Hydrate (1 in 20) add 1 cc. of silver ammonium nitrate T.S., and heat the mixture on a water bath at 60° for 10 minutes: no darkening occurs.
Packaging and storage—Preserve Amylene Hydrate in tight containers.

Anhydrohydroxyprogesterone

ANHYDROHYDROXYPROGESTERONE

Anhydrohydroxyprogesteronum

Anhydrohydroxyprogest.—Ethisterone



$C_{21}H_{28}O_2$ Mol. wt. 312.43

Description—Anhydrohydroxyprogesterone occurs as white or slightly yellow crystals or as a crystalline powder. It is odorless and is stable in air. It is affected by light.

Solubility—Anhydrohydroxyprogesterone is practically insoluble in water; it is slightly soluble in alcohol, in ether, in other organic solvents, and in vegetable oils.

Melting range—Anhydrohydroxyprogesterone melts between 266° and 273°, page 667.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Anhydrohydroxyprogesterone, determined in a solution in dioxane, containing in each 10 cc. 100 mg. of Anhydrohydroxyprogesterone, previously dried over sulfuric acid for 4 hours, and using a 100-mm. tube, is not less than +18° and not more than +28°, page 675.

Identification—

A: Reflux 25 mg. of Anhydrohydroxyprogesterone with 3 cc. of a methanol solution of semicarbazide acetate, prepared by dissolving 150 mg. of semicarbazide hydrochloride and 225 mg. of sodium acetate in 50 cc. of methanol. Reflux the mixture for about 2 hours until a precipitate forms, and then reflux for an additional 5 minutes; cool, filter, wash the precipitate with a little cold methanol, and recrystallize it from 70 per cent methanol: the melting range of the crystals, dried at 100°, is between 228° and 232°.

B: Reflux 25 mg. of Anhydrohydroxyprogesterone for 5 hours with 3.5 cc. of a methanol solution of hydroxylamine acetate, prepared by dissolving 50 mg. of hydroxylamine hydrochloride and 50 mg. of sodium acetate in 25 cc. of methanol. Precipitate the ketoxime with 15 cc. of water, filter, wash the precipitate with water, and recrystallize it from 70 per cent methanol: the melting range of the crystals, dried at 100°, is between 226° and 230°.

Packaging and storage—Preserve Anhydrohydroxyprogesterone in well-closed, light-resistant containers.

AVERAGE DOSE—**10 mg.** (approximately 1/6 grain).

ANHYDROHYDROXYPROGESTERONE TABLETS

Tabellæ Anhydrohydroxyprogesteroni

Tab. Anhydrohydroxyprogest.

Anhydrohydroxyprogesterone Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{21}H_{28}O_2$.

Identification—The Anhydrohydroxyprogesterone obtained in the *Assay* melts between 266° and 273°.

Assay—Weigh a counted number of not less than 10 Anhydrohydroxyprogesterone Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 50 mg. of anhydrohydroxyprogesterone, into the thimble of a micro Soxhlet extractor. Extract with petroleum benzin for 4 hours and discard the extract. Remove the thimble from the extractor and allow the petroleum benzin to evaporate. Replace the thimble in the Soxhlet apparatus and extract the anhydrohydroxyprogesterone with chloroform for 4 hours, using a previously dried and tared extraction flask. Evaporate the extract almost to dryness, and remove the last traces of chloroform at room temperature with the aid of a current of air. Dry the residue of $C_{21}H_{28}O_2$ to constant weight at 105°, cool, and weigh.

Packaging and storage—Preserve Anhydrohydroxyprogesterone Tablets in well-closed, light-resistant containers.

Sizes—Anhydrohydroxyprogesterone Tablets usually available contain the following amounts of anhydrohydroxyprogesterone: 5 and 10 mg. (1/12 and 1/6 grains).

AVERAGE DOSE OF ANHYDROHYDROXYPROGESTERONE—**10 mg.** (approximately 1/6 grain).

ANISE OIL

Oleum Anisi

Ol. Anisi

Anise Oil is the volatile oil distilled with steam from the dried, ripe fruit of *Pimpinella Anisum* Linné (Fam. *Umbelliferæ*) or from the dried ripe fruit of *Illicium verum* Hooker filius (Fam. *Magnoliaceæ*).

Note—If solid material has separated, carefully warm the mixture at a low temperature until it is completely liquefied, and mix it thoroughly before using.

Description—Anise Oil is a colorless or pale yellow, strongly refractive liquid, having the characteristic odor and taste of anise.

Solubility—Anise Oil is soluble in 3 volumes of 90 per cent alcohol with not more than a slight cloudiness.

Specific gravity—The specific gravity of Anise Oil is not less than 0.978 and not more than 0.988.

Congealing temperature—Anise Oil congeals at a temperature not lower than 15°, page 629.

Optical rotation—The optical rotation of Anise Oil is not more than −2° and not more than +1° in a 100-mm. tube, page 675.
Refractive index—The refractive index of Anise Oil is not less than 1.5530 and not more than 1.5600 at 20°, page 682.
Heavy metals—Anise Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 658.
Phenols—A solution of recently distilled Anise Oil in 90 per cent alcohol (1 in 3) is neutral to moistened litmus paper, and the mixture develops no blue or brownish color upon the addition of 1 drop of ferric chloride T.S. to 5 cc. of the solution.
Packaging and storage—Preserve Anise Oil in well-filled, tight containers and avoid exposure to excessive heat.

Anise Water

ANISE WATER

Aqua Anisi

Aq. Anisi

Anise Water is a clear, saturated solution of anise oil in distilled water, prepared by one of the processes described under *Waters*, page 726.

Antimony Potassium Tartrate

ANTIMONY POTASSIUM TARTRATE

Antimonii Potassii Tartras

Antimon. Pot. Tart.—Antimonyl Potassium Tartrate, Tartar Emetic

$K(SbO)C_4H_4O_6.\frac{1}{2}H_2O$ Mol. wt. 333.94

Antimony Potassium Tatrate contains not less than 99 per cent of $K(SbO)C_4H_4O_6.\frac{1}{2}H_2O$.

Description—Antimony Potassium Tartrate occurs as colorless, odorless, transparent crystals, or as a white powder. The crystals effloresce upon exposure to air. Its solution is slightly acid to litmus.
Solubility—One Gm. of Antimony Potassium Tartrate dissolves in 12 cc. of water and in about 15 cc. of glycerin. One Gm. of it dissolves in about 3 cc. of boiling water. It is insoluble in alcohol.
Identification—
A: When heated to redness, Antimony Potassium Tartrate chars, emits an odor resembling that of burning sugar, and leaves a blackened residue. This residue has an alkaline reaction, and when a small fragment of it is held in a non-luminous flame, a violet tint is produced.
B: In a solution of Antimony Potassium Tartrate (1 in 20) acidified with hydrochloric acid, hydrogen sulfide T.S. produces an orange red precipitate, which is soluble in ammonium sulfide T.S. or in sodium hydroxide T.S.
Arsenic—Dissolve 100 mg. of Antimony Potassium Tartrate in 5 cc. of hydrochloric acid. Add 10 cc. of a recently prepared solution of 20 Gm. of stannous

chloride in 30 cc. of hydrochloric acid. Mix well, transfer to a color-comparator tube, and allow to stand for 30 minutes. Viewed downward over a white surface, the color of the mixture appears no deeper than that of a solution contained in a similar tube, prepared and treated in the same manner, omitting the Antimony Potassium Tartrate, and to which has been added 0.02 mg. of arsenic trioxide.

Assay—Dissolve about 500 mg. of Antimony Potassium Tartrate, accurately weighed, in 30 cc. of water, add 25 cc. of a cold, saturated solution of sodium bicarbonate and a few drops of starch T.S., and immediately titrate with tenth-normal iodine to the production of a persistent blue color. Each cc. of tenth-normal iodine is equivalent to 16.70 mg. of $K(SbO)C_4H_4O_6.\frac{1}{2}H_2O$.

Packaging and storage—Preserve Antimony Potassium Tartrate in well-closed containers.

AVERAGE DOSE—

Oral, as expectorant, **3 mg.** (approximately 1/20 grain).

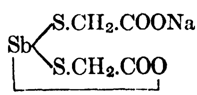
Intravenous, for tropical diseases, **30 mg.**, increasing to **150 mg.** (approximately 1/2 to 2½ grains).

Antimony Sodium Thioglycollate

ANTIMONY SODIUM THIOGLYCOLLATE

Antimonii Sodii Thioglycollas

Antimon. Sod. Thioglycol.



$C_4H_4O_4NaS_2Sb$ Mol. wt. 324.95

Antimony Sodium Thioglycollate, when dried at 100° for 4 hours, contains not less than 35.5 per cent and not more than 38.5 per cent of Sb, corresponding to not less than 94.7 per cent $C_4H_4O_4NaS_2Sb$.

Description—Antimony Sodium Thioglycollate occurs as a white or pink powder. It is odorless or has a faint mercaptan odor, and is discolored by light.

Solubility—Antimony Sodium Thioglycollate is freely soluble in water. It is insoluble in alcohol.

Identification—

A: To 3 cc. of a solution of Antimony Sodium Thioglycollate (1 in 100) add 1 drop of diluted hydrochloric acid and 2 drops of a solution of ferric chloride (1 in 100): a transient blue color is produced. A deep red color is produced on the subsequent addition of 1 drop of dilute ammonia T.S. (1 in 10).

B: To 3 cc. of a solution of Antimony Sodium Thioglycollate (1 in 100) add 1 cc. of sodium hydroxide T.S.: a white precipitate is produced.

C: Dissolve 100 mg. of Antimony Sodium Thioglycollate in 2 cc. of water and pass in hydrogen sulfide: an orange precipitate is produced.

Loss on drying—When dried at 100° for 4 hours, Antimony Sodium Thioglycollate loses not more than 2 per cent of its weight.

Assay—Dissolve about 600 mg. of Antimony Sodium Thioglycollate, previously dried at 100° for 4 hours and accurately weighed, in 250 cc. of water and 25 cc. of hydrochloric acid. Add 1 Gm. of tartaric acid, heat to boiling, and filter, if neces-

sary, into a beaker, washing the filter with water. Pass hydrogen sulfide into the filtrate until precipitation is complete. Allow to stand for 30 minutes, heat to boiling, and pass in hydrogen sulfide for 2 to 3 minutes. Collect the precipitate on a tared Gooch crucible, wash the precipitate successively with hydrogen sulfide T.S., alcohol, ether, carbon disulfide, alcohol and ether, then dry it to constant weight at 100°, and weigh. The weight of antimony sulfide so obtained multiplied by 0.7169, represents the Sb.

Packaging and storage—Preserve Antimony Sodium Thioglycollate in tight, light-resistant containers.

AVERAGE DOSE—**50 mg.** (approximately ¾ grain).

Antimony Sodium Thioglycollate Injection

ANTIMONY SODIUM THIOGLYCOLLATE INJECTION

Injectio Antimonii Sodii Thioglycollatis

Inj. Antimon. Sod. Thioglycol.

Antimony Sodium Thioglycollate Injection is a sterile solution of Antimony Sodium Thioglycollate in water for injection. It contains an amount of antimony (Sb) equivalent to not less than 33.7 per cent and not more than 40.0 per cent of the labeled amount of $C_4H_4O_4NaS_2Sb$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

One per cent of Sodium Citrate and 0.1 per cent of thioglycollic acid may be used as a preservative.

Sterilize Antimony Sodium Thioglycollate Injection preferably by Process C or Process F, see *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Assay—Transfer to a beaker an accurately measured volume of Antimony Sodium Thioglycollate Injection containing about 500 mg. of antimony sodium thioglycollate. Dilute to about 250 cc. with water, add 25 cc. of hydrochloric acid, and proceed as directed in the *Assay* under *Antimony Sodium Thioglycollate*, page 45, beginning with "Add 1 Gm. of tartaric acid . . ."

Packaging and storage—Preserve Antimony Sodium Thioglycollate Injection in hermetic or other suitable containers, see *Containers for Injections*, page 630.

Sizes—Antimony Sodium Thioglycollate Injection usually available contains the following amounts of antimony sodium thioglycollate: 50 mg. (¾ grain) in 10 cc.; 100 mg. (1½ grain) in 20 cc.

AVERAGE DOSE OF ANTIMONY SODIUM THIOGLYCOLLATE—**50 mg.** (approximately ¾ grain).

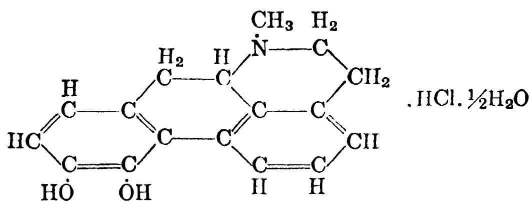
Antitoxins

Apomorphine Hydrochloride

APOMORPHINE HYDROCHLORIDE

Apomorphinæ Hydrochloridum

Apomorph. Hydrochlor.



$C_{17}H_{17}O_2N.HCl.\frac{1}{2}H_2O$ Mol. wt. 312.79

Apomorphine Hydrochloride is the hydrochloride of an alkaloid prepared from morphine.

Description—Apomorphine Hydrochloride occurs as minute, white or grayish white, glistening crystals or white powder. It gradually acquires a green color on exposure to light and air. It is odorless. Its solution is neutral to litmus.

Solubility—One Gm. of Apomorphine Hydrochloride dissolves in about 50 cc. of water and in about 50 cc. of alcohol. One Gm. dissolves in about 20 cc. of water at 80°. It is very slightly soluble in chloroform and in ether.

Identification—

A: To 5 cc. of a solution of Apomorphine Hydrochloride (1 in 100) add a slight excess of a solution of sodium bicarbonate (1 in 20): a white or greenish white precipitate is formed. Add 3 drops of iodine T.S., and shake the mixture vigorously: an emerald green solution is produced. Add 5 cc. of ether and, after vigorous shaking, allow the layers to separate: the ether solution is colored deep ruby red while the water layer retains its green color.

B: Apomorphine Hydrochloride dissolves in nitric acid, producing a dark purple solution.

C: To a solution of Apomorphine Hydrochloride add silver nitrate T.S.: a white precipitate is formed, insoluble in nitric acid. This precipitate soon darkens by reduction to metallic silver, the reduction being accelerated by the addition of ammonia T.S.

Color of Solution—Dissolve 5.0 mg. of Apomorphine Hydrochloride in 100 cc. of water. Transfer exactly 1 cc. of this solution to a suitable test tube, dilute with 6 cc. of water, then add 1 cc. of sodium bicarbonate solution (1 in 20) and follow with 0.5 cc. of iodine T.S. Allow to stand for 30 seconds, then add 0.6 cc. of tenth-normal sodium thiosulfate, and dilute with water to 10 cc. This solution represents the color standard.

Place 100 mg. of Apomorphine Hydrochloride in a test tube of the same size as used for the preparation of the color standard, add 10 cc. of oxygen-free water, and agitate gently until dissolved: the color of the resulting solution, observed promptly after the Apomorphine Hydrochloride has dissolved, is not more intense than that of the standard.

Residue on ignition—The residue on ignition from 200 mg. of Apomorphine Hydrochloride is negligible, page 685.

Decomposition products—Shake 100 mg. of Apomorphine Hydrochloride with 5 cc. of ether: the latter acquires not more than a pale reddish color.

Packaging and storage—Preserve Apomorphine Hydrochloride in small, tight, light-resistant vials containing not more than 350 mg.

AVERAGE DOSE—Emetic, subcutaneous—**5 mg.** (appr oximately $\frac{1}{12}$ grain).

Apomorphine Hydrochloride Tablets

APOMORPHINE HYDROCHLORIDE TABLETS

Tabellæ Apomorphinæ Hydrochloridi

Tab. Apomorph. Hydrochlor.

Apomorphine Hydrochloride Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{17}H_{17}O_2N.HCl.\frac{1}{2}H_2O$.

Identification—Add sodium bicarbonate solution to 5 cc. of a filtered solution of the Tablets containing about 10 mg. of apomorphine hydrochloride: a white or greenish precipitate is formed which rapidly becomes green on exposure to air. When the mixture is shaken with a few cc. of ether, the ether acquires a violet color, and the water solution an emerald green color.

Color of solution—Dissolve a quantity of the powdered Tablets, equivalent to 5 mg. of apomorphine hydrochloride, in sufficient water to make 100 cc. Transfer exactly 1 cc. of the solution to a test tube, dilute with 6 cc. of water, and, if necessary, filter through a small pledget of cotton. Add 1 cc. of sodium bicarbonate solution (1 in 20) and follow with 0.5 cc. of iodine T.S. Allow to stand for 30 seconds, then add 0.6 cc. of tenth-normal sodium thiosulfate, and dilute with water to 10 cc. This solution represents the color standard.

Place a quantity of powdered Apomorphine Hydrochloride Tablets, equivalent to 50 mg. of apomorphine hydrochloride, in a test tube of suitably small size, add 10 cc. of cold, oxygen-free water, stopper the test tube, and agitate gently until no more dissolves; then, if necessary, filter at once through a small pledget of cotton. The color of the solution, observed promptly after preparation, is not more intense than that of the color standard, using closely matched test tubes for the comparison.

Assay—Weigh a counted number of not less than 20 Apomorphine Hydrochloride Tablets and reduce them to a fine powder without appreciable loss. Dissolve an accurately weighed portion of the powder, equivalent to about 50 mg. of apomorphine hydrochloride, in 25 cc. of water in a separator, add 500 mg. of sodium bi-

carbonate, and completely extract the apomorphine hydrochloride with successive small portions of peroxide-free ether. Combine the ether extracts and wash them with three 5-cc. portions of water. Shake the combined water washings with 10 cc. of ether and add this ether to the combined ether extracts. Add to the ether solution 20 cc. of fiftieth-normal sulfuric acid, agitate thoroughly, allow to separate, and draw off the water layer into a flask. Wash the ether with two 5-cc. portions of water, add these washings to the flask, and titrate the excess acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 6.256 mg. of $C_{17}H_{17}O_2N.HCl.\frac{1}{2}H_2O$.

Packaging and storage—Preserve Apomorphine Hydrochloride Tablets in tight, light-resistant containers.

Sizes—Apomorphine Hydrochloride Tablets usually available contain the following amount of apomorphine hydrochloride: 5 mg. ($\frac{1}{12}$ grain).

AVERAGE DOSE OF APOMORPHINE HYDROCHLORIDE—Emetic, subcutaneous, **5 mg.** (approximately $\frac{1}{12}$ grain).

PAGE
Aromatic Ammonia Spirit 36
Aromatic Cascara Sagrada Fluidextract .. 116

Aromatic Elixir

AROMATIC ELIXIR

Elixir Aromaticum

Elix. Arom.—Simple Elixir

COMPOUND ORANGE SPIRIT	12 cc.
SYRUP	375 cc.
TALC	30 Gm.
ALCOHOL,	
DISTILLED WATER, each, a sufficient quantity,	
To make	1000 cc.

To the compound orange spirit add enough alcohol to make 250 cc. To this solution add the syrup in several portions, agitating vigorously after each addition, and afterwards add, in the same manner, a sufficient quantity of distilled water to make the product measure 1000 cc. Mix the talc intimately with the liquid, and filter through a filter, wetted with diluted alcohol, returning the first portions of the filtrate until a clear liquid is obtained.

Alcohol content—From 22 to 24 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Aromatic Elixir in tight containers.

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Aromatic Rhubarb Syrup 447
Aromatic Rhubarb Tincture .. 447

Arsenic Trioxide

ARSENIC TRIOXIDE

Arseni Trioxidum

Arsen. Trioxid.—Arsenious Acid, Arsenious Oxide

As_2O_3 Mol. wt. 197.82

Arsenic Trioxide, when dried at 100° for 3 hours, contains not less than 99.5 per cent of As_2O_3.

Caution—Arsenic Trioxide is extremely poisonous.

Description—Arsenic Trioxide occurs as a white, odorless powder. It is stable in air.

Solubility—Arsenic Trioxide is slowly soluble in water. It is slightly soluble in alcohol and in ether, and freely soluble in glycerin. It is dissolved by hydrochloric acid and by solutions of alkali hydroxides and carbonates.

Identification—Add hydrogen sulfide T.S. to a solution of Arsenic Trioxide (1 in 100) prepared with the aid of heat: the mixture is yellow. Add a few drops of hydrochloric acid to this mixture: a yellow precipitate of arsenic trisulfide is produced.

Loss on drying—When dried at 100° for 3 hours, Arsenic Trioxide loses not more than 1 per cent of its weight.

Residue on ignition.—Not more than 1 mg. of residue remains on the ignition, under a hood, of 1 Gm. of Arsenic Trioxide.

Foreign substances—Dissolve 1 Gm. of Arsenic Trioxide in 10 cc. of ammonia T.S. with the aid of a gentle heat: solution is complete, or only a very slight trace of white, insoluble material remains.

Assay—Dissolve about 200 mg. of Arsenic Trioxide, previously dried at 100° for 3 hours and accurately weighed, in 20 cc. of boiling water, adding sufficient sodium hydroxide T.S. to effect complete solution. Neutralize this solution with diluted sulfuric acid, using phenolphthalein T.S. as the indicator, cool, dissolve in it 2 Gm. of sodium bicarbonate, and titrate with tenth-normal iodine, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 4.946 mg. of As_2O_3.

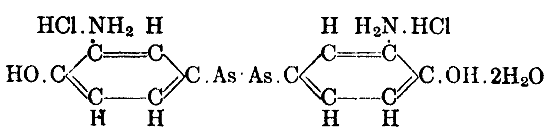
Packaging and storage—Preserve Arsenic Trioxide in well-closed containers.

Arsphenamine

ARSPHENAMINE

Arsphenamina

Arsphen.—Diaminodihydroxyarsenobenzene Dihydrochloride



$C_{12}H_{12}As_2N_2O_2.2HCl.2H_2O$ Mol. wt. 475.01

Arsphenamine contains not less than 30 per cent and not more than 32 per cent of arsenic (As).

Arsphenamine must be prepared in an establishment licensed for the purpose by the United States Government upon recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being offered for sale must comply with the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Description—Arsphenamine occurs as a light yellow powder. It is odorless or has a slight odor, and is hygroscopic. In the dry state or in solution it is oxidized by exposure to the air, becoming darker and more toxic. Its solutions are acid to litmus paper.

Solubility—Arsphenamine is soluble in water, in alcohol, and in glycerin, but only very slightly soluble in chloroform and in ether.

Identification—

A: A solution of Arsphenamine (1 in 100) is unaffected by the addition of diluted hydrochloric acid, even after heating (difference from *neoarsphenamine*). With an excess of hydrochloric acid a precipitate is formed. The addition of diluted sulfuric acid or of a solution of an alkali sulfate immediately produces a precipitate.

B: The addition of 2 drops of freshly prepared ferric chloride T.S. to 5 cc. of a solution of Arsphenamine (1 in 1000) produces a brownish violet color, which rapidly changes to deep red.

C: Add 3 cc. of silver nitrate T.S. to 5 cc. of a solution of Arsphenamine (1 in 100): a red color is produced, but no precipitate is formed even after standing at ordinary room temperature for 10 minutes. Now add 5 cc. of nitric acid and heat: a white precipitate forms which dissolves in an excess of ammonia T.S.

D: The solution resulting from the *Assay for arsenic* yields with hydrogen sulfide a yellow precipitate, soluble in ammonium carbonate T.S.

Total acid—Dissolve 100 mg. of Arsphenamine, accurately weighed, in 10 cc. of water in a small flask, add 5 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide, watching the supernatant liquid for the end-point: not less than 3.9 cc. and not more than 4.3 cc. of tenth-normal sodium hydroxide is required.

Completeness of solubility—Add 600 mg. of Arsphenamine to 20 cc. of water in a small flask and agitate the mixture gently: complete solution results within 15 minutes.

Assay for arsenic—Place about 200 mg. of Arsphenamine, accurately weighed, in a glass-stoppered, 200- to 300-cc. flask. Add 1 Gm. of finely powdered potassium permanganate and 5 cc. of diluted sulfuric acid, and allow to stand for 10 minutes, frequently rotating the contents of the flask to insure thorough mixing. Cautiously add 10 cc. of sulfuric acid in portions of about 2 cc. each, rotating the flask after each addition. When the reaction has ceased, add sufficient hydrogen peroxide T.S. to dissolve the brown precipitate completely (about 5 to 7 cc.). Toward the end of the reaction the hydrogen peroxide T.S. is to be added dropwise to avoid any great excess. Dilute with 25 cc. of water, and boil gently over an asbestos-wire gauze for 15 to 20 minutes, or until the excess of hydrogen peroxide is expelled. Dilute with 50 cc. of water, and add tenth-normal potassium permanganate until the liquid is faintly pink, then discharge the pink color by the addition of a drop of tenth-normal oxalic acid. Cool the solution, add 2.5 Gm. of potassium iodide, stopper the flask tightly, and allow it to stand in a cool, dark place for 1 hour. Then titrate the liberated iodine with tenth-normal sodium thiosulfate without the use of starch indicator. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 3.746 mg. of As.

Packaging and storage—Preserve Arsphenamine in a cool place, at a temperature preferably not above 25° in hermetic containers of colorless glass, from which the

air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the amount in grams or milligrams of Arsphenamine contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label on the outside of the container of one or more ampuls must bear the official title, the amount in grams or milligrams of Arsphenamine contained in the individual ampul, the lot number of the product, the name and address of the manufacturer, the U. S. License number of the manufacturer, and the expiration date for the product.

The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its quality) shall not be more than 5 years from the date of release of that lot by the National Institute of Health.

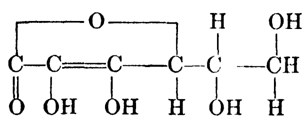
AVERAGE DOSE—Intravenous, **0.3 Gm.** (approximately 5 grains). *Prior to injection the solution must be alkalinized with 0.85 cc. of normal sodium hydroxide for each 0.1 Gm. of Arsphenamine.*

Ascorbic Acid

ASCORBIC ACID

Acidum Ascorbicum

Acid. Ascorb.—Vitamin C



$C_6H_8O_6$ Mol. wt. 176.12

Ascorbic acid, when dried in a vacuum desiccator over sulfuric acid for 3 hours, contains not less than 99 per cent of $C_6H_8O_6$.

Description—Ascorbic Acid occurs as white or slightly yellow crystals or powder. It is odorless, and on exposure to light it gradually darkens. In the dry state, Ascorbic Acid is reasonably stable in air, but in solution it rapidly deteriorates in the presence of air. It melts at about 190°. Its solution is acid to litmus paper.

Solubility—One Gm. of Ascorbic Acid dissolves in about 3 cc. of water and in about 30 cc. of alcohol; it is insoluble in chloroform, in ether, and in benzene.

Specific rotation—The specific rotation, $[\alpha]^{25}_{D}$, of Ascorbic Acid, determined in a solution containing the equivalent of 10 Gm. in 100 cc. of solution, using a 200-mm. tube, is between +20.5° and +21.5°, page 675.

Identification—

A: A solution of Ascorbic Acid (1 in 50) slowly reduces alkaline cupric tartrate T.S. at room temperature but more readily upon heating.

B: To 1 cc. of a solution of Ascorbic Acid (1 in 50) add a few drops of sodium nitroprusside T.S., then add 1 cc. of tenth-normal sodium hydroxide: a blue color is produced immediately.

C: Dissolve 15 mg. of Ascorbic Acid in 15 cc. of a solution of trichloroacetic acid (1 in 20), add about 200 mg. of activated charcoal, shake the mixture vigorously for 1 minute, and filter through a small fluted filter, returning the filtrate, if necessary, until clear. To 5 cc. of the filtrate add 1 drop of pyr-

role, and agitate gently until dissolved, then heat in a bath at 50°: a blue color develops.

Residue on ignition—Ascorbic Acid yields not more than 0.1 per cent of residue on ignition, page 685.

Heavy metals—Dissolve 1 Gm. of Ascorbic Acid in 20 cc. of water, add 0.5 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Ascorbic Acid is 20 parts per million.

Assay—Dissolve about 400 mg. of Ascorbic Acid, previously dried for 3 hours in a vacuum desiccator over sulfuric acid and accurately weighed, in a mixture of 100 cc. of recently boiled and cooled water and 25 cc. of diluted sulfuric acid, and titrate the solution at once with tenth-normal iodine, adding a few drops of starch T.S. as the end-point is neared. Each cc. of tenth-normal iodine is equivalent to 8.806 mg. of $C_6H_8O_6$.

Packaging and storage—Preserve Ascorbic Acid in tight containers.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Ascorbic Acid Tablets

ASCORBIC ACID TABLETS

Tabellæ Acidi Ascorbici

Tab. Acid. Ascorb.—Vitamin C Tablets

Ascorbic Acid Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of $C_6H_8O_6$.

Identification—Triturate a quantity of finely powdered Ascorbic Acid Tablets with sufficient diluted alcohol to make approximately the equivalent of ascorbic acid 1 in 50, and filter. This filtrate responds to *Identification tests B* and *C* under *Ascorbic Acid*, page 52.

Assay—Grind in a mortar a counted number of not less than 10 Ascorbic Acid Tablets in sufficient extracting solution (see *Ascorbic Acid Assay*, page 620) to make a paste. Transfer the paste to a 500-cc. volumetric flask with the aid of 225 cc. of extracting solution, and add water to make 500 cc. Using an aliquot of suitable size to require at least 10 cc. of the standard dichlorophenol-indophenol solution for titration, proceed as directed under *Ascorbic Acid Assay*, page 620.

Packaging and storage—Preserve Ascorbic Acid Tablets in tight containers.

Sizes—Ascorbic Acid Tablets usually available contain the following amounts of ascorbic acid: 25, 50, and 100 mg. (3/8, 3/4, and 1 1/2 grains).

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Aspidium

ASPIDIUM

Aspidium

Aspidium consists of the rhizome and stipes of *Dryopteris Filix-mas* (Linné) Schott, known in commerce as European Aspidium or Male

Fern, or of *Dryopteris marginalis* (Linné) Asa Gray, known in commerce as American Aspidium or Marginal Fern (Fam. *Polypodiaceæ*).

Aspidium yields not less than 1.5 per cent of crude filicin.

Description—

Unground Aspidium—Rhizome, 1 to 3 cm. in thickness, cylindraceous and nearly straight, or curved and tapering toward one end, usually split longitudinally and showing large, angular stipe-scars, in which the ends of vascular bundles are often visible, and, occasionally, adhering feathery masses of reddish brown ramenta. Stipes, nearly cylindrical, but tapering toward one end, nearly straight or somewhat curved, 3 to 5 cm. in length, and about 8 mm. in thickness; externally weak reddish brown to brownish gray, or, if peeled, light brown to weak yellow; fracture short, internally pale green to weak greenish yellow or brown, spongy, and exhibiting an interrupted circle of from 2 to 13 vascular bundles; odor slight; taste, at first sweetish and astringent, then bitter and acrid.

Histology—An outer row of epidermal cells and several rows of orange to greenish orange, thick-walled, lignified, hypodermal cells; a large central area consisting of starch-bearing, fundamental parenchyma with intercellular spaces into which project characteristic, more or less pyriform, short-stalked, oleoresin glands; vascular bundles xylocentric, consisting of a central xylem composed of scalariform or occasionally reticulate tracheids, completely surrounded by a phloem of rounded, thin-walled phloem cells and sieve tubes, the bundle being surrounded by a 1- to 3-layered pericycle and a single row of endodermal cells; starch abundant, ovoid, oblong, ellipsoidal, or irregular, 2 to 25 microns in length. Ramentum composed of elongated, thin-walled cells with occasional 2-celled projections on the margin, but no glands, except at the base, where there are usually two.

Foreign organic matter—The amount of *Foreign organic matter* in Aspidium does not exceed 2 per cent, pages 710 and 711.

Acid-insoluble ash—Aspidium yields not more than 3 per cent of *Acid-insoluble ash*, pages 710 and 711.

Assay—Prepare an ether extract from 40 Gm. of Aspidium as directed under *Aspidium Oleoresin*, page 54, and assay it as directed under *Aspidium Oleoresin*, using all of the oleoresin obtained for the assay.

Aspidium Oleoresin

ASPIDIUM OLEORESIN

Oleoresina Aspidii

Oleores. Aspid.—Male Fern Oleoresin

Aspidium Oleoresin yields not less than 24 per cent of crude filicin.

Aspidium, recently reduced to coarse powder........... 500 Gm.
Ethyl Oxide, a sufficient quantity.

Place the aspidium in a cylindrical glass percolator provided with a stopcock, and with a cover and a receptacle suitably arranged for safe use with volatile liquids. Pack the powder firmly, and percolate slowly with ethyl oxide added in successive portions until the drug is exhausted. Recover the greater part of the ethyl oxide from the percolate by distilla-

tion on a water bath, and, having transferred the residue to a dish, allow the remaining ether to evaporate spontaneously in a warm place, remote from a naked flame.

Description—A dark green, thick liquid, usually depositing a granular, crystalline substance, which must be thoroughly mixed with the liquid portion before use.
Solubility—Not less than 85 per cent of the Oleoresin is soluble in petroleum benzin.
Specific gravity—Not less than 1.00.
Assay—Warm the Aspidium Oleoresin on a water bath, and stir until it is thoroughly mixed. Transfer about 3 Gm. of it, accurately weighed, to a 250-cc. flask, and dissolve it in 40 cc. of ether. Add 75 cc. of a 3 per cent solution of barium hydroxide, and shake the mixture vigorously for 5 minutes. Transfer the mixture to a separator, allow the liquids to separate completely, and draw off and filter the barium hydroxide layer. Rinse the flask with two 25-cc. portions of a 3 per cent solution of barium hydroxide, transfer each rinsing separately to the separator, shake the mixture for 1 minute, allow the liquids to separate completely, and draw off and filter the barium hydroxide layer. Transfer the combined filtered barium hydroxide solutions to a separator, render distinctly acid to litmus paper by the addition of hydrochloric acid, and extract with three successive portions of 30, 20, and 15 cc. of ether. Filter the combined ether solutions, and wash the filter with ether. Evaporate the filtrate and washings, and dry the residue to constant weight at 100°. The weight of the crude filicin so obtained is not less than 24 per cent of the weight of Oleoresin taken for the assay.
Packaging and storage—Preserve Aspidium Oleoresin in well-closed containers.

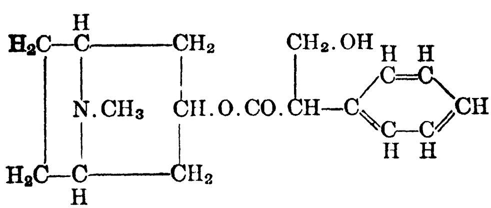
AVERAGE DOSE—*Caution*—Single dose, **4 Gm.** (approximately 60 grains).

Atropine

ATROPINE

Atropina

Atrop.



$C_{17}H_{23}O_3N$ Mol. wt. 289.36

An alkaloid usually obtained from *Atropa Belladonna* Linné, from species of *Datura* and *Hyoscyamus* (Fam. *Solanaceæ*), or produced synthetically.

Caution—Atropine is extremely poisonous.

Description—Atropine occurs as white crystals, usually needle-like, or as a white, crystalline powder. Its saturated solution is alkaline to phenolphthalein T.S. It is optically inactive, but usually contains some lævorotatory hyoscyamine.

Solubility—*One Gm. of Atropine dissolves in 460 cc. of water, in 2 cc. of alcohol, in* about 27 cc. of glycerin, in 1 cc. of chloroform, and in about 25 cc. of ether. One Gm. of it dissolves in 90 cc. of water at 80°.

Melting range—Atropine melts between 114° and 116°, page 667.

Identification—

A: Add a few drops of nitric acid to about 10 mg. of Atropine contained in a porcelain dish, and evaporate the mixture to dryness on a water bath: a yellow residue is obtained. Add to the cooled residue a few drops of alcoholic potassium hydroxide T.S. and a fragment of potassium hydroxide: the mixture is intensely violet in color (*hyoscyamine* and *scopolamine*, similarly treated, produce the same color as Atropine, but the presence of *other alkaloids* obscures the color effect.)

B: Gold chloride T.S. produces in a solution of Atropine (1 in 50) in diluted hydrochloric acid a lusterless precipitate (*hyoscyamine* similarly treated yields a lustrous precipitate).

Residue on ignition—Atropine yields not more than 0.1 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 200 mg. of Atropine in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680, and the solution is colored no more than light yellow upon the addition of 0.2 cc. of nitric acid.

Other alkaloids—Dissolve 200 mg. of Atropine in 1 cc. of normal hydrochloric acid and sufficient water to make exactly 15 cc. of solution. To 5 cc. of the solution add a few drops of platinic chloride T.S.: no precipitate is formed. To a separate 5-cc. portion of the solution add 2 cc. of ammonia T.S., and shake vigorously: the mixture may develop a slight opalescence but no turbidity is produced.

Limit of Hyoscyamine—Dissolve 1 Gm. of Atropine, previously dried over sulfuric acid to constant weight, in sufficient 50 per cent alcohol (by weight) to make a volume of 20 cc. at 25°: the angular rotation of this solution, using a 200-mm. tube, does not exceed −0.70°, page 675.

Packaging and storage—Preserve Atropine in light-resistant containers.

AVERAGE DOSE—**0.4 mg.** (approximately 1/150 grain).

Atropine Sulfate

ATROPINE SULFATE

Atropinæ Sulfas

Atrop. Sulf.

$(C_{17}H_{23}O_3N)_2 . H_2SO_4 . H_2O$ Mol. wt. 694.82

Caution—Atropine Sulfate is extremely poisonous.

Description—Atropine Sulfate occurs as colorless crystals, or as a white, crystalline powder. It effloresces in dry air, and is affected by light.

Solubility—One Gm. of Atropine Sulfate dissolves in 0.5 cc. of water, in 5 cc. of alcohol, and in about 2.5 cc. of glycerin. One Gm. of it dissolves in 2.5 cc. of boiling alcohol.

Melting temperature—Atropine Sulfate, dried at 110° for 4 hours, melts at a temperature not lower than 188°, page 667.

Identification—

A: Add a few drops of nitric acid to about 10 mg. of Atropine Sulfate contained in a porcelain dish, and evaporate the mixture to dryness on a water bath: a yellow residue is obtained. Add to the cooled residue a few drops of alcoholic potassium hydroxide T.S. and a fragment of potassium hydroxide: the mixture is intensely violet in color (*hyoscyamine* and *scopolamine*, similarly treated, produce the same color as Atropine Sulfate, but the presence of *other alkaloids* obscures the color effect).

B: Gold chloride T.S. produces in a solution of Atropine Sulfate (1 in 50) a lusterless precipitate (*hyoscyamine*, similarly treated, yields a lustrous precipitate).

C: A solution of Atropine Sulfate (1 in 20) responds to the test for *Sulfate*, page 663.

Free acid—A solution of 1 Gm. of Atropine Sulfate in 20 cc. of water requires not more than 0.3 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried at 110° for 4 hours, Atropine Sulfate loses not more than 4 per cent of its weight.

Residue on ignition—Atropine Sulfate yields not more than 0.2 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 200 mg. of Atropine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680, and the solution is colored no more than light yellow upon the addition of 0.2 cc. of nitric acid.

Other alkaloids—A solution containing 250 mg. of Atropine Sulfate in 1 cc. of tenth-normal hydrochloric acid and sufficient water to measure exactly 15 cc. meets the requirements of the test for *Other alkaloids* under *Atropine*, page 55.

Limit of Hyoscyamine—Dissolve 1 Gm. of Atropine Sulfate, previously dried over sulfuric acid to constant weight, in sufficient water to make a volume of 20 cc. at 25°: the angular rotation of this solution, using a 200-mm. tube, does not exceed −0.60°, page 675.

Packaging and storage—Preserve Atropine Sulfate in tight, light-resistant containers.

AVERAGE DOSE—**0.5 mg.** (approximately 1/120 grain).

Atropine Sulfate Tablets

ATROPINE SULFATE TABLETS

Tabellæ Atropinæ Sulfatis

Tab. Atrop. Sulf.

Atropine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $(C_{17}H_{23}O_3N)_2.H_2SO_4.H_2O$ for tablets of 20 mg. or more; and not less than 90 per cent and

not more than 110 per cent of the labeled amount for tablets of less than 20 mg.

Identification—

A: Dissolve a portion of powdered Atropine Sulfate Tablets, equivalent to about 1 mg. of atropine sulfate, in 10 cc. of water, and filter the solution. Instil 1 drop of this solution into the eye of a cat or other animal: the pupil shows noticeable dilation within 2 hours.

B: A filtered solution of Atropine Sulfate Tablets responds to the tests for *Sulfate*, page 663.

Assay—Weigh a counted number of not less than 20 Atropine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 60 mg. of atropine sulfate, and transfer it completely to a 100-cc. volumetric flask. Add 40 cc. of water and 5 cc. of diluted sulfuric acid, shake the mixture occasionally during 2 hours, and allow to stand over night. Add water to the 100-cc. mark, mix thoroughly, and filter, if necessary, through a filtering crucible or through a sintered glass crucible. Transfer to a separator an accurately measured portion of the solution or filtrate, equivalent to about 40 mg. of atropine sulfate, make the solution distinctly alkaline with ammonia T.S., and completely extract the alkaloids with small, successive portions of chloroform. Combine the chloroform extracts, and for each 50 cc. of the chloroform add 10 cc. of neutralized alcohol, and evaporate the mixture to dryness on a steam bath, but do not prolong the heating after the residue has become dry. Dissolve the residue in 3 cc. of alcohol, and add exactly 20 cc. of fiftieth-normal sulfuric acid. Heat gently to expel any chloroform, cool, then titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 6.948 mg. of $(C_{17}H_{23}O_3N)_2 \cdot H_2SO_4 \cdot H_2O$.

If the tablets are of very small grainage, thus necessitating the use of a large number of tablets for the test, the extraction of the alkaloid may be made in the following manner:

Place a counted number of Tablets, equivalent to about 40 mg. of Atropine Sulfate, in a glass mortar. Add sufficient water to cover the tablets, and triturate to a smooth paste. Completely transfer the mixture, with the aid of small portions of water, to a separator, making the total volume about 100 cc. Add 5 cc. of diluted sulfuric acid, mix well, and allow to stand over night. Render the solution distinctly alkaline with ammonia T.S., and completely extract the alkaloid by shaking with successive portions of approximately 75 cc. each of chloroform. Evaporate the combined chloroform extracts on a steam bath to 1 or 2 cc., add 3 cc. of diluted sulfuric acid and 20 cc. of water, and heat on a steam bath until all of the chloroform is expelled. Filter into a separator, and wash the vessel in which the evaporation was made, and the filter with small portions of water to remove the alkaloid completely. Then proceed as described above, beginning with "make the solution distinctly alkaline with ammonia T.S."

NOTE—This assay is applicable to uncoated Tablets. For coated Tablets, a suitable modification of this assay or another suitable assay method may be necessary.

Packaging and storage—Preserve Atropine Sulfate Tablets in well-closed containers.

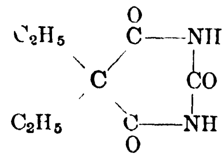
Sizes—Atropine Sulfate Tablets usually available contain the following amounts of atropine sulfate: 0.3, 0.4, 0.5, 0.6, and 1.2 mg. ($\frac{1}{200}$, $\frac{1}{150}$, $\frac{1}{120}$, $\frac{1}{100}$, and $\frac{1}{50}$ grain).

AVERAGE DOSE OF ATROPINE SULFATE—**0.5 mg.** (approximately $\frac{1}{120}$ grain).

BARBITAL

Barbitalum

Barbital.—Diethylbarbituric Acid, Barbitone, Diethylmalonylurea



$C_8H_{12}N_2O_3$ Mol. wt. 184.19

Description—Barbital occurs as colorless or white crystals, or as a white, crystalline powder. It is odorless, has a slightly bitter taste, and is stable in air. Its solutions are acid to litmus paper.

Solubility—One Gm. of Barbital dissolves in 130 cc. of water, in about 15 cc. of alcohol, in 75 cc. of chloroform, and in 35 cc. of ether. One Gm. of it dissolves in about 13 cc. of boiling water. It is also soluble in acetone, and in ethyl acetate.

Melting range—Barbital melts between 188° and 192°, page 667.

Identification—

A: A saturated solution of Barbital yields with mercuric nitrate T.S. a white precipitate which is soluble in ammonia T.S.

B: When Barbital is boiled with an excess of sodium carbonate T.S. for 30 minutes, or fused with sodium hydroxide, it is decomposed with the evolution of ammonia.

Loss on drying—When dried over sulfuric acid for 3 hours, Barbital loses not more than 1 per cent of its weight.

Residue on ignition—Barbital yields not more than 0.1 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 500 mg. of Barbital in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Benzene derivatives—Shake 500 mg. of Barbital with 5 cc. of nitric acid: the mixture does not become yellow.

Packaging and storage—Preserve Barbital in well-closed containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

BARBITAL TABLETS

Tabellae Barbitali

Tab. Barbital.

Barbital Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $C_8H_{12}N_2O_3$.

Identification—Triturate a quantity of finely powdered Barbital Tablets, equivalent to about 500 mg. of barbital, with 10 cc. of petroleum benzin, then decant the liquid as completely as possible. Again treat the residue in the same manner with 5 cc. of petroleum benzin. Macerate the residue with 15 cc. of alcohol for 30 minutes, filter, evaporate the filtrate to dryness on a steam bath, and dry the residue at

about 100°: the barbital so obtained melts between 188° and 192°, and responds to *Identification tests A* and *B* under *Barbital*, page 59.

Assay—Weigh a counted number of not less than 20 Barbital Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 300 mg. of barbital, transfer it completely to a separator, and dissolve it as far as possible in 10 cc. of alkaline sodium chloride solution, made by saturating a solution of sodium hydroxide (1 in 50) with sodium chloride. If lubricants other than stearic acid or stearates are present, extract the solution with two 15-cc. portions of ether, and discard the ether. Add 2 cc. of hydrochloric acid and 5 cc. of water, shake well, and completely extract the barbital with chloroform. Test for completeness of extraction by extracting with an additional 10-cc. portion of chloroform and evaporating the solvent: not more than 0.5 mg. of residue remains. Wash the combined chloroform extracts with two portions of water acidified with a drop of hydrochloric acid, extract the washings with two 5-cc. portions of chloroform, and add these to the chloroform extract. Filter the combined extracts through a pledget of cotton or other suitable filter into a tared beaker, and wash the separator and the filter with several small portions of chloroform. Evaporate the combined filtrate and washings on a steam bath with the aid of a current of air, dry the residue of barbital at 100° for 2 hours, cool, and weigh. When stearic acid or stearates are present, make the correction described in the *Assay* of *Phenobarbital Tablets*, page 401.

Packaging and storage—Preserve Barbital Tablets in well-closed containers.

Sizes—Barbital Tablets usually available contain the following amount of barbital: 300 mg. (5 grains).

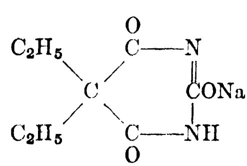
AVERAGE DOSE OF BARBITAL—0.3 Gm. (approximately 5 grains).

Barbital Sodium

BARBITAL SODIUM

Barbitalum Sodicum

Barbital. Sod.—Soluble Barbital, Soluble Barbitone



$C_8H_{11}N_2O_3Na$ — Mol. wt. 206.18

Barbital Sodium contains not less than 88 per cent and not more than 90 per cent of $C_8H_{12}N_2O_3$, calculated on a moisture-free basis, corresponding to not less than 98.5 per cent of $C_8H_{11}N_2O_3Na$.

Description—Barbital Sodium occurs as a white powder. It is odorless, has a bitter taste, and is stable in air. Its solutions are alkaline to litmus paper and to phenolphthalein T.S.

Solubility—One Gm. of Barbital Sodium dissolves in about 5 cc. of water and in 2.5 cc of boiling water It is slightly soluble in alcohol and is insoluble in ether.

Identification—
A: A saturated solution of the barbital obtained in the assay yields with mercuric nitrate T.S. a white precipitate which is soluble in ammonia T.S.
B: The residue left upon the ignition of Barbital Sodium responds to the tests for *Sodium*, page 663.
C: The addition of diluted hydrochloric or sulfuric acid to a solution of Barbital Sodium (1 in 20) produces a white precipitate of barbital.
D: The barbital obtained in the assay melts between 188° and 192°, page 667.

Loss on drying—When dried at 100° for 3 hours, Barbital Sodium loses not more than 1 per cent of its weight.

Heavy metals—Dissolve 2 Gm. of Barbital Sodium in 40 cc. of water. Add slowly, with vigorous stirring, 10 cc. of normal hydrochloric acid, and filter, rejecting the first 5 cc. of the filtrate: the heavy metals limit, page 657, for Barbital Sodium, determined upon 25 cc. of the filtrate, is 20 parts per million.

Readily carbonizable substances—Dissolve 500 mg. of Barbital Sodium in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Uncombined barbital—Shake 500 mg. of Barbital Sodium with 20 cc. of absolute ether for 10 minutes, filter, evaporate the ether in a tared dish, and dry the residue at 100° for 1 hour: the weight of the residue does not exceed 3 mg.

Assay—Dissolve about 500 mg. of Barbital Sodium, accurately weighed, in 15 cc. of water in a separator, add to the solution 2 cc. of hydrochloric acid, shake well, and completely extract the liberated barbital with 25-cc. portions of chloroform. Test for completeness of extraction by extracting with an additional 10-cc. portion of chloroform and evaporating the solvent: not more than 0.5 mg. of residue remains. Wash the combined extracts with two portions of 5 cc. each of water, and extract the combined water washings with two 5-cc. portions of chloroform. Filter the combined extracts through a pledget of cotton, or other suitable filter, into a tared beaker, and wash the separator and the filter with several small portions of chloroform. Evaporate the combined filtrate and washing on a steam bath with the aid of a current of air, dry the residue of $C_8H_{12}N_2O_3$ at 100° for 2 hours, cool, and weigh.

Packaging and storage—Preserve Barbital Sodium in well-closed containers.

AVERAGE DOSE—0.3 Gm. (approximately 5 grains).

Barbital Sodium Tablets

BARBITAL SODIUM TABLETS

Tabellæ Barbitali Sodici

Tab. Barbital. Sod.

Barbital Sodium Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $C_8H_{11}N_2O_3Na$.

Identification—
A: Digest a quantity of finely powdered Barbital Sodium Tablets equal to about 1 Gm. of barbital sodium with 10 cc. of water, and filter if necessary. Add to the filtrate 3 cc. of diluted hydrochloric acid: a white precipitate of barbital is produced. Collect the precipitate on a filter, wash it with cold water until the washings are practically free from chloride, then dry at 80°. The barbital so obtained melts between 188° and 192° and responds to *Identification tests A* and *B* under *Barbital*, page 59.
B: A solution of the Tablets responds to the flame test for *Sodium*, page 663.

Assay—Weigh a counted number of not less than 20 Barbital Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a por-

tion of the powder, equivalent to about 300 mg. of barbital sodium, transfer it completely to a separator, and proceed as directed in the *Assay* under *Barbital Tablets*, page 59, beginning with "and dissolve it as far as possible." The weight of the barbital so obtained, multiplied by 1.119, represents the weight of $C_8H_{11}N_2O_3Na$ in the portion of the Tablets taken for the assay.

Packaging and Storage—Preserve Barbital Sodium Tablets in well-closed containers.

Sizes—Barbital Sodium Tablets usually available contain the following amount of barbital sodium: 300 mg. (5 grains).

AVERAGE DOSE OF BARBITAL SODIUM—**0.3 Gm.** (approximately 5 grains).

Barium Sulfate

BARIUM SULFATE

Barii Sulfas

$BaSO_4$ Mol. wt. 233.42

Caution—When Barium Sulfate is prescribed, the title should always be written out in full to avoid confusion with the poisonous barium sulfide or sulfite.

Description—Barium Sulfate is a fine, white, odorless, tasteless, bulky powder, free from grittiness.

Solubility—Barium Sulfate is insoluble in water, in organic solvents, and in solutions of acids and of alkalies.

Bulkiness—Place 5 Gm. of Barium Sulfate, previously sifted through a No. 60 sieve, in a dry graduated cylinder provided with a glass stopper, and having the 50-cc. graduation 11 to 14 cm. from the bottom. Add enough water to make the mixture measure 50 cc. Agitate the mixture briskly for exactly 1 minute, and set it aside for sedimentation: within 15 minutes the Barium Sulfate does not settle below the 11-cc. graduation.

Identification—

A: Mix 500 mg. of Barium Sulfate with 2 Gm. each of anhydrous sodium carbonate and anhydrous potassium carbonate, heat the mixture in a crucible until fusion is complete, treat the resulting fused mass with hot water, and filter. The filtrate, acidulated with hydrochloric acid, responds to the tests for *Sulfate*, page 663.

B: Dissolve a portion of the well-washed residue from test *A* in acetic acid: the solution responds to the tests for *Barium*, page 658.

Free acid or alkali—Digest 1 Gm. of Barium Sulfate with 20 cc. of water during 5 minutes: the water remains neutral to litmus paper.

Sulfide—Boil 10 Gm. of Barium Sulfate with a mixture of 10 cc. of diluted hydrochloric acid and 90 cc. of water for 10 minutes in a 250-cc. Erlenmeyer flask, and add sufficient water to restore the original volume. During the boiling, expose lead acetate test paper to the escaping vapor: the paper does not darken.

Acid-soluble substances—Cool the mixture obtained in the test for *Sulfide*, and filter it through paper which has been previously washed with a mixture of 10 cc. of diluted hydrochloric acid and 90 cc. of water, returning the first portions, if necessary, to obtain a perfectly clear filtrate. Evaporate 50 cc. of the filtrate to dryness on a water bath, and add 2 drops of hydrochloric acid and 10 cc. of hot water. Filter through acid-washed paper, as prepared above, wash the filter with 10 cc. of hot water, and evaporate the combined filtrate and washings to dryness

in a tared dish on a water bath. The residue, when dried to constant weight at 110°, weighs not more than 15 mg.

Soluble barium salts—Treat the residue obtained in the test for *Acid-soluble substances* with 10 cc. of water, filter the solution through a filter previously washed with a mixture of 10 cc. of diluted hydrochloric acid and 90 cc. of water, and add 0.5 cc. of diluted sulfuric acid: no turbidity develops within 30 minutes.

Phosphate—Boil 1 Gm. of Barium Sulfate with a mixture of 3 cc. of nitric acid and 5 cc. of water during 5 minutes, and add water to restore the original volume. Filter through a filter previously washed with diluted nitric acid, and add to the warm filtrate an equal volume of ammonium molybdate T.S.: no yellow precipitate is formed.

Arsenic—A 2-Gm. portion of Barium Sulfate meets the requirements of the test for *Arsenic*, page 618 (1 part per million).

Heavy metals—Boil 4 Gm. of Barium Sulfate with 2 cc. of glacial acetic acid and 48 cc. of water for 10 minutes. Add sufficient water to make the volume measure 50 cc., filter, and use 25 cc. of the filtrate: the heavy metals limit, page 657, for Barium Sulfate is 10 parts per million.

Packaging and storage—Preserve Barium Sulfate in well-closed containers.

BELLADONNA EXTRACT

Extractum Belladonnæ

Ext. Bellad.—Extractum Belladonnæ Foliorum, Extractum Belladonnæ P.I.

Belladonna Extract yields, from each 100 Gm., not less than 1.15 Gm. and not more than 1.35 Gm. of the alkaloids of belladonna leaf.

PILULAR BELLADONNA EXTRACT

Prepare an extract by percolating 1000 Gm. of belladonna leaf, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug during 16 hours and then percolate it at a moderate rate. Evaporate the percolate to a pilular consistence under reduced pressure and at a temperature not exceeding 60°, and adjust the remaining extract, after assaying, by dilution with liquid glucose so that the finished Extract will contain, in each 100 Gm., 1.25 Gm. of the alkaloids of belladonna leaf.

Assay—Weigh accurately 3 Gm. of Pilular Belladonna Extract and mix it with a suitable quantity of an adsorbent (see *Proximate Assays*, page 676). Transfer completely, with the aid of a few cc. of alcohol or ether, to an extraction thimble, insert the thimble in a Soxhlet or similar extractor, moisten with a mixture of 3 cc. of stronger ammonia T.S., 5 cc. of alcohol, and 10 cc. of ether, and mix thoroughly. Macerate overnight, and extract it for not less than 3 hours or until completely extracted (see *Extraction of Drugs*, page 676), using ether as the solvent. Then proceed as directed under the *Assay* for *Belladonna Leaf*, page 64, beginning with the words, "Transfer the liquid to a separator . . ." Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of belladonna leaf.

POWDERED BELLADONNA EXTRACT

Prepare an extract by percolating 1000 Gm. of belladonna leaf, using alcohol as the menstruum. Macerate the drug during 16 hours and then percolate it slowly. Evaporate the percolate to a soft extract under reduced pressure and at a temperature not exceeding 60°, add 50 Gm. of dry starch, and continue the evaporation, at the same temperature, until the product is dry. Powder the residue. The extract may be deprived of its fat by treating either the soft extract first obtained, or the dry and powdered extract, as directed under *Extracts*, page 643. Assay the powdered residue and add sufficient starch, dried at 100°, to make the finished Extract contain, in each 100 Gm., 1.25 Gm. of the alkaloids of belladonna leaf. Mix the powders thoroughly and pass the Extract through a fine sieve.

Assay—Weigh accurately about 3 Gm. of Powdered Belladonna Extract, place it in an extraction thimble, insert the thimble in a Soxhlet or similar extractor, moisten the Extract with a mixture of 3 cc. of stronger ammonia T.S., 5 cc. of alcohol, and 10 cc. of ether, and mix thoroughly. Macerate over night, and extract it for not less than 3 hours or until completely extracted (see *Extraction of Drugs*, page 676), using ether as the solvent. Then proceed as directed under the *Assay* for *Belladonna Leaf*, page 64, beginning with the words "Transfer the liquid to a separator." Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of belladonna leaf.

Packaging and storage—Preserve Belladonna Extract in tight containers, preferably at a temperature not above 30°.

AVERAGE DOSE—**15 mg.** (approximately 1/4 grain).

Belladonna Leaf

BELLADONNA LEAF

Belladonnæ Folium

Bellad. Fol.—Deadly Nightshade Leaf, Belladonnæ folium P. I.

Belladonna Leaf consists of the dried leaf and flowering or fruiting top with branches of *Atropa Belladonna* Linné (Fam. *Solanaceæ*).

Belladonna Leaf yields not less than 0.3 per cent of the alkaloids of Belladonna Leaf.

Description—

Unground Belladonna Leaf—Usually matted together, crumpled or broken; leaves mostly light green to moderate olive green, from 5 to 20 cm. in length, and from 4 to 12 cm. in width, broadly ovate, apex acute, margin entire, narrowed into the petiole, with few hairs, the latter more abundant along the veins, and numerous light-colored dots (crystal cells) visible with a lens; stems more or

less hollow and flattened, finely hairy when young; flowers with campanulate corolla possessing 5 small, reflexed lobes, yellowish purple, becoming faded to brown or dusky yellow, usually subtended by the five-lobed calyx; fruit nearly globular, dark yellowish brown to dusky red or purplish black with numerous, flattened, somewhat reniform seeds, the latter up to 2 mm. in width; odor slight, somewhat tobacco-like when moistened; taste somewhat bitter and acrid.

Histology—Leaf: epidermis of lamina with wavy vertical walls and distinctly striated cuticle; stomata more numerous on the lower surface and with 3 or 4 neighboring cells, one of which is smaller than the others; non-glandular hairs 2- to 6-celled; glandular hairs, short-stalked with 1- to many-celled heads; cells filled with microcrystals numerous in the mesophyll; midrib with strands of perimedullary phloem. Stem: with long, thin-walled, slightly lignified pericyclic fibers, bicollateral fibrovascular bundles, parenchyma interspersed with crystal cells, and a few hairs. Pollen grains narrow, ellipsoidal, with three meridional furrows. Seed: epidermis with convolute, thickened cell walls.

Powdered Belladonna Leaf—Light olive brown to moderate olive green in color. The following are among the elements of identification: the separate microcrystals, the dark gray crystal cells, the cuticular striping of the epidermal cells, the tracheæ with ellipsoidal, bordered pores, the fibers of the stem, and, rarely, the hairs and pollen grains. Examine Belladonna Leaf for rosette aggregates and raphides of calcium oxalate: their presence indicates adulteration.

Belladonna stems—The amount of belladonna stems in Belladonna Leaf does not exceed 25 per cent. The amount of belladonna stems, over 10 mm. in diameter, in Belladonna Leaf does not exceed 3 per cent.

Acid-insoluble ash—Belladonna Leaf yields not more than 3 per cent of *Acid-insoluble ash*, pages 710 and 711.

Assay—Place 10 Gm. of Belladonna Leaf in moderately coarse powder in an extraction thimble, and insert the thimble in a Soxhlet, or similar extractor. Moisten the drug with a mixture of 8 cc. of stronger ammonia T.S., 10 cc. of alcohol, and 20 cc. of ether, and mix thoroughly. Macerate over night, then extract with ether for not less than 3 hours or until the alkaloids are completely extracted (see *Extraction of Drugs*, page 676). The following alternative process may be used: Moisten 10 Gm. of Belladonna Leaf in moderately coarse powder (if a powder finer than "moderately coarse" is used for the assay, washed sand or asbestos fibers may be used to facilitate extraction) with a mixture of 8 cc. of stronger ammonia T.S., 20 cc. of ether, and 10 cc. of chloroform, in a small percolator, the outlet of which has been packed with a pledget of purified cotton. Macerate over night, pack it in the percolator, and extract by percolating slowly with a mixture of 3 volumes of ether and 1 volume of chloroform. Continue the percolation until the 3 or 4 cc. of percolate last passed, when evaporated to dryness and the residue dissolved in approximately half-normal sulfuric acid and treated with mercuric iodide T.S., show only a faint turbidity. If the volume of liquid obtained by either the Soxhlet or percolation method of extraction is large, reduce it to a convenient volume by evaporating on a water bath.

Transfer the liquid to a separator, rinse the container with one or more small volumes of the solvent, and add the rinsings to the separator. Completely remove the alkaloids from the immiscible solvent by extracting with successive portions of approximately half-normal sulfuric acid (see *Purification of the Alkaloids*, page 677), filtering each portion drawn off. Render the combined acid solutions distinctly alkaline with ammonia T.S., and completely remove the alkaloids at once by extracting with successive portions of chloroform. Evaporate the combined chloroform extractions to dryness on a water bath and then heat in a bath of boiling water for 15 minutes. Dissolve the residue in a small volume of chloroform, evaporate to dryness on a water bath, and heat in a bath of boiling water for 15 minutes. Dissolve the resulting residue in a few cc. of chloroform, add 15 cc. of fiftieth-normal sulfuric acid, remove the chloroform by evaporation, cool, and titrate the excess acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of Belladonna Leaf.

Packaging and storage—Preserve Belladonna Leaf in well-closed containers.

Belladonna Ointment

BELLADONNA OINTMENT

Unguentum Belladonnæ

Ung. Bellad.—Unguentum Belladonnæ P. I.

Belladonna Ointment yields not less than 0.110 per cent and not more than 0.140 per cent of the alkaloids of belladonna leaf.

Pilular Belladonna Extract	100 Gm.
Diluted Alcohol	50 cc.
Yellow Ointment	850 Gm.
To make about	1000 Gm.

Triturate the extract with the diluted alcohol until a smooth mixture is obtained, and then incorporate it with the yellow ointment (see page 2).

Assay—Weigh accurately about 20 Gm. of Belladonna Ointment in a tared beaker or other suitable vessel. Add about 40 cc. of warm, approximately half-normal sulfuric acid, and heat the mixture on a water bath for 15 minutes with frequent agitation. Cool until the fatty material separates in a solid layer. Pierce the fat layer, and filter through a pledget of cotton into a separator. Repeat this extraction in the same manner until all alkaloids are removed (see *Purification of Alkaloids*, page 677), using successive portions of 40, 30, 20, and 20 cc. of approximately half-normal acid, and filtering each portion into the separator through the filter previously used. Complete the assay as directed under *Belladonna Leaf*, page 64, beginning with the words, "Render the combined acid solutions distinctly alkaline with ammonia T.S." Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of belladonna leaf.

Belladonna Tincture

BELLADONNA TINCTURE

Tinctura Belladonnæ

Tr. Bellad.—Belladonna Leaf Tincture, Tinctura Belladonnæ P.I.

Belladonna Tincture yields, from each 100 cc., not less than 27 mg. and not more than 33 mg. of the alkaloids of belladonna leaf.

Belladonna Leaf, in moderately coarse powder	100 Gm.
To make about	1000 cc.

Prepare a tincture by Process P as modified for assayed tinctures, page 708, using a mixture of 3 volumes of alcohol and 1 volume of water

as the menstruum. Finally adjust the Tincture to contain, in each 100 cc., 30 mg. of the alkaloids of belladonna leaf.

Assay—Measure accurately 100 cc. of Belladonna Tincture, and evaporate it at a temperature not exceeding 100°, to a volume of about 10 cc. Transfer the concentrated liquid to a separator containing 25 cc. of chloroform, rinse the container with small portions of diluted alcohol, and add the rinsings to the separator. Add 25 cc. of water, and render the mixture alkaline by the addition of ammonia T.S.; then completely extract the alkaloids with successive portions of chloroform. Complete the assay as directed under *Belladonna Leaf*, page 64, beginning with the words, "Completely remove the alkaloids from the immiscible solvent by extracting with successive portions of approximately half-normal sulfuric acid." Each cc. of fiftieth-normal acid is the equivalent of 5.787 mg. of the alkaloids of belladonna leaf.

Packaging and storage—Preserve Belladonna Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol content—From 65 to 70 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—**0.6 cc.** (approximately 10 minims).

Bentonite

BENTONITE

Bentonitum

Benton.

Bentonite is a native, colloidal, hydrated aluminum silicate.

Description—Bentonite is a very fine, odorless, pale buff, or cream-colored powder, free from grit, and has a slightly earthy taste.

Solubility—Bentonite is insoluble in water, but swells to approximately twelve times its volume when added to water. It is insoluble and does not swell in organic solvents.

Gel formation—Intimately mix 6 Gm. of Bentonite with 300 mg. of magnesium oxide. Add the mixture, in several divided portions, to 200 cc. of water contained in a 500-cc. glass-stoppered cylinder. Agitate thoroughly for 1 hour. Transfer 100 cc. of the mixture to a 100 cc. cylinder, and allow to remain undisturbed for 24 hours: not more than 2 cc. of supernatant liquid appears on the surface.

Swelling power—To 100 cc. of water contained in a glass-stoppered cylinder of 100-cc. capacity, add 2 Gm. of Bentonite in divided portions, allowing each to settle before adding the next. The mass at the bottom gradually swells until it occupies an apparent volume of not less than 24 cc.

Fineness of powder—Add 2 Gm. of Bentonite to 20 cc. of water contained in a mortar. Allow to swell, disperse evenly with a pestle, and dilute the mixture with water to 100 cc. Pour the suspension through a No. 200 standard mesh sieve and wash the sieve thoroughly with water. No grit is felt when the fingers are rubbed over the wire mesh of the sieve.

Loss on drying—When dried at 110° to constant weight, Bentonite loses not less than 5 per cent and not more than 8 per cent of its weight.

Reaction—A 2 per cent suspension of Bentonite in water has a pH between 9 and 10.

Packaging and storage—Preserve Bentonite in well-closed containers.

Bentonite Magma

BENTONITE MAGMA

Magma Bentoniti

Magma Benton.

BENTONITE	50 Gm.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Sprinkle the bentonite, in divided portions, upon 800 cc. of hot distilled water, until all of the bentonite has been wetted. Allow it to stand with occasional stirring for 24 hours. Then stir until a uniform magma is obtained, add enough distilled water to make 1000 cc., and mix thoroughly.

Packaging and storage—Preserve Bentonite Magma in tight containers.

Benzalkonium Chloride

BENZALKONIUM CHLORIDE

Benzalkonii Chloridum

Benzalkon. Chlorid.—Alkyldimethyl-benzylammonium Chloride

Benzalkonium Chloride is a mixture of alkyl dimethyl-benzylammonium chlorides of the general formula, $C_6H_5CH_2N(CH_3)_2RCl$, in which R represents a mixture of the alkyls from C_8H_{17} to $C_{18}H_{37}$. It contains, when calculated on a moisture-free basis, not less than 97 per cent and not more than 103 per cent of $C_6H_5CH_2N(CH_3)_2RCl$.

Description—Benzalkonium Chloride occurs as a white or yellowish white, amorphous powder, or in the form of gelatinous pieces. It has an aromatic odor, and a very bitter taste. Its solution is slightly alkaline to litmus paper and strongly foams when shaken.

Solubility—Benzalkonium Chloride is very soluble in water, in alcohol or in acetone; it is almost insoluble in ether, and is slightly soluble in benzene.

Identification—

A: The addition of diluted nitric acid or of mercuric chloride T.S. to a solution of Benzalkonium Chloride (1 in 100) produces a white precipitate which is soluble in alcohol.

B: Dissolve about 200 mg. of Benzalkonium Chloride in 1 cc. of sulfuric acid, add 100 mg. of sodium nitrate, and heat on a steam bath for 5 minutes. Cool, dilute with water to 10 cc., add 500 mg. of zinc dust, and warm for 5 minutes on a steam bath. To 2 cc. of the clear supernatant liquid add 1 cc. of sodium nitrite solution (1 in 20), cool in ice water, then add 3 cc. of a solution of 500 mg. of betanaphthol in 10 cc. of ammonium T.S.: an orange red color is produced.

C: A solution of Benzalkonium Chloride in a mixture of equal volumes of water and of alcohol responds to the tests for *chloride*, page 659.

Loss on drying—When dried at 110°, to constant weight, Benzalkonium Chloride loses not more than 15 per cent of its weight.

Residue on ignition—Benzalkonium Chloride yields not more than 0.2 per cent of residue on ignition, page 685.

Inorganic ammonium compounds—To 5 cc. of a solution of Benzalkonium Chloride (1 in 50) add 3 cc. of sodium hydroxide T.S., and heat to boiling: the odor of ammonia is not perceptible.

Assay—Transfer about 2 Gm. of Benzalkonium Chloride, accurately weighed, to a 100-cc. volumetric flask, add water to dissolve it, dilute with water to 100 cc., and mix well. Transfer exactly 50 cc. of the solution to a 200-cc. volumetric flask, and add 8 cc. of a buffer solution, made by dissolving 26 Gm. of sodium acetate and 22 cc. of acetic acid in sufficient water to make 100 cc. Then add, while stirring, 50 cc. of twentieth-molar potassium ferricyanide, dilute with water to the 200-cc. mark, mix well, and allow to stand for 1 hour. Filter through a dry filter, and discard the first 20 cc. of the filtrate. To 100 cc. of the subsequent filtrate add 10 cc. of potassium iodide T.S. and 10 cc. of diluted hydrochloric acid, and allow to stand for 1 minute. Add 10 cc. of zinc sulfate solution (1 in 10), and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator toward the end. Determine the molarity of the potassium ferricyanide solution in the same manner as in the assay of the Benzalkonium Chloride. Each cc. of twentieth-molar potassium ferricyanide is equivalent to 55 mg. of alkyl dimethyl-benzylammonium chlorides.

Transfer exactly 25 cc. of the solution described in the first sentence of the *Assay* into a flask, and dilute with 30 cc. of alcohol. Add exactly 25 cc. of tenth-normal silver nitrate, 3 cc. of nitric acid, and 3 cc. of nitrobenzene. Shake vigorously, and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 35.4 mg. of alkyl dimethyl-benzylammonium chlorides and the quantity of alkyl dimethyl-benzylammonium chlorides, multiplied by 2, corresponds to within 3 per cent above or below the quantity found by the potassium ferricyanide assay.

Packaging and storage—Preserve Benzalkonium Chloride in tight, light-resistant containers.

Benzalkonium Chloride Solution

BENZALKONIUM CHLORIDE SOLUTION

Liquor Benzalkonii Chloridi

Liq. Benzalkon. Chlorid.

Benzalkonium Chloride Solution is an aqueous solution containing not less than 93 per cent and not more than 107 per cent of the labeled amount of benzalkonium chloride, including all tolerances.

Description—Benzalkonium Chloride Solution is a clear, colorless liquid. It has an aromatic odor and a bitter taste; it is slightly alkaline to litmus.

Identification—Benzalkonium Chloride Solution responds to *Identification tests A* and *C* under *Benzalkonium Chloride*, page 68. The residue obtained by evaporating, on a steam bath, a volume of the Solution equivalent to about 200 mg. of benzalkonium chloride responds to *Identification test B* under *Benzalkonium Chloride*, page 68.

Inorganic ammonium compounds—A volume of Benzalkonium Chloride Solution, equivalent to 100 mg. of benzalkonium chloride, when evaporated, or diluted, to

a concentration of 1 to 50, meets the requirement of the test for *Inorganic ammonium compounds* under *Benzalkonium Chloride*, page 68.

Residue on evaporation—Evaporate an accurately measured volume of Benzalkonium Chloride Solution, equivalent to about 100 mg. of benzalkonium chloride, to dryness on a steam bath, and dry at 100° to constant weight: the weight of the residue corresponds to not more than 3 per cent above and not more than 3 per cent below the quantity of benzalkonium chloride present in the same volume of the Solution as calculated from the *Assay*.

Assay—Transfer an accurately measured volume of Benzalkonium Chloride Solution, equivalent to about 1 Gm. of benzalkonium chloride, to a 200-cc. volumetric flask, and then proceed as directed under the *Assay* of *Benzalkonium Chloride*, page 68, beginning with the words "add 8 cc. of a buffer solution." Each cc. of twentieth-molar potassium ferricyanide is equivalent to 55 mg. of benzalkonium chloride.

If the Solution is too dilute, concentrate an accurately measured volume on a steam bath to yield about 1 Gm. of benzalkonium chloride in 100 cc.

Packaging and storage.—Preserve Benzalkonium Chloride Solution in tight, light-resistant containers.

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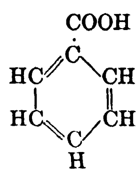
Benzoic Acid

BENZOIC ACID

Acidum Benzoicum

Acid. Benz.

$C_7H_6O_2$



Mol. wt. 122.12

Benzoic Acid, dried over sulfuric acid for 3 hours, contains not less than 99.3 per cent of $C_7H_6O_2$.

Description—Benzoic Acid occurs as white crystals, usually as scales or needles. It is odorless, or it may have a slight odor of benzaldehyde or of benzoin. It is somewhat volatile at moderately warm temperatures, and is freely volatile in steam.

Solubility—One Gm. of Benzoic Acid dissolves in 275 cc. of water, in 3 cc. of alcohol, in 5 cc. of chloroform, and in about 3 cc. of ether. One Gm. of the Acid dissolves in 20 cc. of boiling water, and in 1.5 cc. of boiling alcohol. It is soluble in fixed and in volatile oils and is sparingly soluble in petroleum benzin.

Melting range—Benzoic Acid melts between 121° and 123°, page 667.

Identification—Benzoic Acid responds to the tests for *Benzoate*, page 658.

Residue on ignition—Benzoic Acid yields not more than 0.05 per cent of residue on ignition, page 685.

Chlorinated compounds—Mix 500 mg. of Benzoic Acid and 700 mg. of calcium carbonate with a little water in a crucible, dry the mixture, and incinerate it at a low red heat. Dissolve the residue in 20 cc. of diluted nitric acid, filter, wash the filter and insoluble residue with 15 cc. of water, and add to the filtrate 0.5 cc. of tenth-normal silver nitrate and enough water to make exactly 50 cc. Dissolve 700 mg.

of the same specimen of calcium carbonate in 20 cc. of diluted nitric acid, filter if necessary, and add 0.5 cc. of tenth-normal silver nitrate and enough water to make 50 cc. of liquid. Add to this mixture, from a burette, fiftieth-normal hydrochloric acid, drop by drop, mixing well after each addition, until the turbidity matches that of the test with the Benzoic Acid: not more than 0.6 cc. of fiftieth-normal hydrochloric acid is required.

Heavy Metals—Dissolve 1 Gm. of Benzoic Acid in 25 cc. of acetone, add 2 cc. of water and 10 cc. of hydrogen sulfide T.S. Any color produced is not darker than that of a control made with 25 cc. of acetone, 2 cc. of standard lead solution, page 657, and 10 cc. of hydrogen sulfide T.S. (20 parts per million).

Readily carbonizable substances—Dissolve 500 mg. of Benzoic Acid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid Q, page 680.

Readily oxidizable substances—Add 1.5 cc. of sulfuric acid to 100 cc. of water, heat the mixture to boiling, and add tenth-normal potassium permanganate dropwise until the pink color persists for 30 seconds. Dissolve 1.0 Gm. of Benzoic Acid in the hot solution, and titrate with tenth-normal potassium permanganate to a pink color that persists for 15 seconds: not more than 0.5 cc. of tenth-normal potassium permanganate is consumed.

Assay—Dry about 1 Gm. of Benzoic Acid over sulfuric acid for 3 hours, and dissolve 500 mg. of the dried Acid in 25 cc. of diluted alcohol, which has previously been neutralized with tenth-normal sodium hydroxide, using 3 drops of phenolphthalein T.S. as the indicator. Titrate this solution with tenth-normal sodium hydroxide to a pink color. From the volume of tenth-normal sodium hydroxide consumed, subtract one-fifth of the volume of fiftieth-normal hydrochloric acid used in the test for chlorinated compounds. Each cc. of tenth-normal sodium hydroxide is equivalent to 12.21 mg. of $C_7H_6O_2$.

Packaging and storage—Preserve Benzoic Acid in well-closed containers.

Benzoin

BENZOIN

Benzoinum

Benzoin.

Benzoin is the balsamic resin obtained from *Styrax Benzoin* Dryander, known in commerce as Sumatra Benzoin, or from *Styrax tonkinensis* (Pièrre) Craib ex Hartwich, or other species of the Section *Anthostyrax* of the genus *Styrax*, known in commerce as Siam Benzoin (Fam. *Styraceæ*).

Sumatra Benzoin yields not less than 75 per cent of alcohol-soluble extractive. Siam Benzoin yields not less than 90 per cent of alcohol-soluble extractive.

Description—

Unground Sumatra Benzoin—Blocks or lumps of varying size, made up of tears, compacted together with a reddish brown, reddish gray, or grayish brown resinous mass; tears externally yellowish or rusty brown, milky white on fresh fracture; hard and brittle at ordinary temperatures, but softened by heat and becoming gritty on chewing; odor aromatic. When digested with boiling water, the odor suggests cinnamates or storax; taste, aromatic and slightly acrid.

Unground Siam Benzoin—Pebble-like tears of variable size, compressed, yellowish brown to rusty brown externally, milky white on fracture, separate or very slightly agglutinated, hard and brittle at ordinary temperatures but softened by heat and becoming plastic on chewing; odor agreeable, balsamic, vanilla-like; taste aromatic and slightly acrid.

Identification—The solution of Benzoin in alcohol becomes milky upon the addition of water and the mixture is acid to litmus paper.

Heat a few fragments of Benzoin in a test tube: Sumatra Benzoin evolves a sublimate consisting of plates and small, rod-like crystals that strongly polarize light. Siam Benzoin evolves a sublimate directly above the melted mass consisting of numerous long, rod-shaped crystals, which do not strongly polarize light.

Treat about 250 mg. of Benzoin with 5 cc. of ether, decant about 1 cc. of the ether solution into a porcelain dish, and add to it 2 or 3 drops of sulfuric acid: the solution of Sumatra Benzoin produces a deep reddish brown coloration of the sulfuric acid and the solution of Siam Benzoin produces a deep purplish red coloration.

Benzoic acid—Treat about 1 Gm. of powdered Benzoin with 15 cc. of warm carbon disulfide, filter, wash the filter with an additional 5 cc. of carbon disulfide, and allow the filtrate to evaporate spontaneously: the weight of the residue is not less than 12.5 per cent of the weight of the Benzoin taken. This residue responds to the test for *Identification* under *Benzoic Acid*, page 70.

Cinnamic acid—Heat about 500 mg. of Benzoin in a test tube with 10 cc. of potassium permanganate T.S.: only the Sumatra variety develops a strong odor of benzaldehyde.

Acid-insoluble ash—Sumatra Benzoin yields not more than 1 per cent of *Acid-insoluble ash*, pages 710 and 711. Siam Benzoin yields not more than 0.5 per cent of *Acid-insoluble ash*, pages 710 and 711.

Foreign organic matter—The amount of *Foreign organic matter* in Siam Benzoin does not exceed 1 per cent, pages 710 and 711.

Assay—Place about 2 Gm. of Benzoin, accurately weighed, in a tared extraction thimble, and insert the thimble in a Soxhlet or other suitable continuous extraction apparatus. Place about 100 mg. of sodium hydroxide in the receiving flask of the apparatus, and extract the Benzoin with alcohol for 5 hours, or until completely extracted. Dry the insoluble residue at 100° for 4 hours, and weigh. Determine the amount of moisture in the drug by *Method IX*, pages 710 and 712. Calculate the weight of moisture in the quantity of the Benzoin used for the assay, and subtract it from the original weight of the Benzoin taken for the assay. The difference between this result and the weight of the residue determined above represents the alcohol-soluble extractive.

Labeling—Label Benzoin to indicate whether it is Sumatra Benzoin or Siam Benzoin.

Packaging and storage—Preserve Benzoin in well-closed containers.

Benzoin Tincture

BENZOIN TINCTURE
Tinctura Benzoini

Tr. Benzoin.

BENZOIN, in moderately coarse powder..............	200 Gm
To make..........................	1000 cc.

Prepare a tincture by Process M, page 708, using alcohol as the menstruum.

Packaging and storage—Preserve Benzoin Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 75 to 83 per cent, by volume, of C_2H_5OH.

Benzoin Tincture, Compound

COMPOUND BENZOIN TINCTURE

Tinctura Benzoini Composita

Tr. Benzoin. Co.

BENZOIN, in moderately coarse powder...............	100 Gm.
ALOE, in moderately coarse powder..................	20 Gm.
STORAX...	80 Gm.
TOLU BALSAM..	40 Gm.
To make..........................	1000 cc.

Prepare a tincture by Process M, page 708, using alcohol as the menstruum.

Packaging and storage—Preserve Compound Benzoin Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 74 to 80 per cent, by volume, of C_2H_5OH.

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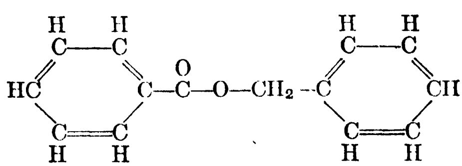
Benzyl Benzoate

BENZYL BENZOATE

Benzylis Benzoas

Benzyl. Benz.



$C_{14}H_{12}O_2$ Mol. wt. 212.24

Benzyl Benzoate contains not less than 99 per cent of $C_{14}H_{12}O_2$.

Description—Benzyl Benzoate is a clear, colorless, oily liquid having a slight aromatic odor and a sharp, burning taste.
Solubility—Benzyl Benzoate is insoluble in water and in glycerin. It is miscible with alcohol, with ether and with chloroform.

Specific gravity—The specific gravity of Benzyl Benzoate is not less than 1.116 and not more than 1.120.

Congealing range—Benzyl Benzoate congeals at a temperature not below 18.0°, page 629.

Identification—

A: To 1 cc. of Benzyl Benzoate in a test tube add 2 cc. of potassium permanganate T.S. and warm gently: the odor of benzaldehyde is noticeable.

B: Evaporate the alcohol from the solution obtained in the *Assay*, and place 5 cc. of the solution in each of two test tubes. Just acidify the contents of the first tube with diluted hydrochloric acid, and add a few drops of ferric chloride T.S.: a salmon-colored precipitate is formed. To the contents of the second tube add 2 cc. of diluted hydrochloric acid: a white precipitate of benzoic acid is formed which is soluble in ether.

Free acid—Add 2 drops of phenolphthalein T.S. to 25 cc. of alcohol, and add tenth-normal sodium hydroxide until a pink color is formed. Add 5 cc. of Benzyl Benzoate, mix well, and titrate with tenth-normal sodium hydroxide. Not more than 0.3 cc. of tenth-normal sodium hydroxide is required to reproduce the pink color.

Assay—Add exactly 25 cc. of half-normal alcoholic potassium hydroxide to about 2 Gm. of Benzyl Benzoate, accurately weighed, and contained in an Erlenmeyer flask fitted with a reflux condenser, and heat just to boiling for 1 hour. Cool, and titrate with half-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. Each cc. of half-normal potassium hydroxide is equivalent to 106.1 mg. of $C_{14}H_{12}O_2$.

Packaging and storage—Preserve Benzyl Benzoate in tight containers and avoid exposure to excessive heat.

Benzyl Benzoate Lotion

BENZYL BENZOATE LOTION

Lotio Benzylis Benzoatis

Lot. Benzyl. Benz.

Benzyl Benzoate Lotion contains not less than 26 per cent and not more than 30 per cent of $C_{14}H_{12}O_2$.

BENZYL BENZOATE	250 cc.
TRIETHANOLAMINE	5 Gm.
OLEIC ACID	20 Gm.
WATER	750 cc.
To make about	1000 cc.

Mix the triethanolamine with the oleic acid, add the benzyl benzoate, and mix well. Transfer the mixture to a suitable container of about 2000-cc. capacity, add 250 cc. of water, and shake the mixture thor-

oughly. Finally add the remaining 500 cc. of water, and again shake thoroughly.

Benzyl Benzoate Lotion may also be prepared as follows:

SAPONATED BENZYL BENZOATE........................	275 cc.
WATER..	725 cc.
To make............................	1000 cc.

Shake the saponated benzyl benzoate with 250 cc. of water in a suitable container of about 2000-cc. capacity, until the benzyl benzoate is well emulsified. Add the remaining 475 cc. of water, and again shake the mixture thoroughly.

Assay—Place about 5 Gm. of Benzyl Benzoate Lotion, accurately weighed, in an Erlenmeyer flask. Add 25 cc. of alcohol and 2 drops of phenolphthalein T.S. Cool the solution to about 15°, and titrate quickly with tenth-normal sodium hydroxide to a slight pink color. Add exactly 50 cc. of half-normal alcoholic potassium hydroxide, connect the flask to a condenser arranged for refluxing, and reflux for 1 hour. Cool, and titrate with half-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. Each cc. of half-normal alcoholic potassium hydroxide is equivalent to 106.1 mg. of $C_{14}H_{12}O_2$.

Packaging and storage—Preserve Benzyl Benzoate Lotion in tight containers.

Benzyl Benzoate, Saponated

SAPONATED BENZYL BENZOATE

Benzylis Benzoas Saponatus

Benzyl. Benz. Sap.

Saponated Benzyl Benzoate contains, in each 100 cc., not less than 93 Gm. and not more than 107 Gm. of $C_{14}H_{12}O_2$.

TRIETHANOLAMINE................................	20 Gm.
OLEIC ACID...	80 Gm.
BENZYL BENZOATE, a sufficient quantity,	
To make..........................	1000 cc.

Mix the triethanolamine with the oleic acid, add sufficient benzyl benzoate to make 1000 cc., and mix well.

Assay—Place 25 cc. of Saponated Benzyl Benzoate, accurately measured, in a 100-cc. volumetric flask, and dilute to the mark with alcohol. Transfer exactly 5 cc. of

this dilution to an Erlenmeyer flask, add 2 drops of phenolphthalein T.S., and titrate quickly with tenth-normal sodium hydroxide to a slight pink color. Then proceed as directed in the *Assay* for *Benzyl Benzoate Lotion*, page 74, beginning with the words "Add exactly 50 cc."

Packaging and storage—Preserve Saponated Benzyl Benzoate in tight containers.

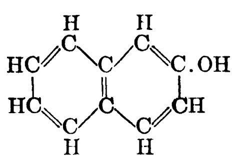
Betanaphthol

BETANAPHTHOL

Betanaphthol

Betanaph.

$C_{10}H_8O$



Mol. wt. 144.16

Description—Betanaphthol occurs as white to pale buff-colored, shining, crystalline leaflets, or as a white or yellowish white, crystalline powder. It has a faint, phenol-like odor, and is stable in air, but darkens on exposure to sunlight. Betanaphthol sublimes readily when heated, and volatilizes with the vapors of alcohol and of water.

Solubility—One Gm. of Betanaphthol dissolves in about 1000 cc. of water, in 1 cc. of alcohol, in about 17 cc. of chloroform, and in 1.5 cc. of ether. One Gm. of it is soluble in about 80 cc. of boiling water. It is soluble in glycerin and in olive oil and is readily dissolved by solutions of alkali hydroxides.

Melting range—Betanaphthol melts between 120° and 122°, page 667.

Identification—

A: A cold, saturated solution of Betanaphthol, when mixed with ammonia T.S., develops a faint, bluish fluorescence.

B: Add about 100 mg. of Betanaphthol to 5 cc. of a solution of potassium hydroxide (1 in 4), then add 1 cc. of chloroform, and gently warm the mixture: the water layer acquires a blue color which changes successively to green and brown.

C: Ferric chloride T.S. produces a greenish color in a cold, saturated solution of Betanaphthol, and after some time causes the separation of whitish flakes, which turn brown when heated.

Residue on ignition—Betanaphthol yields not more than 0.1 per cent of residue on ignition, page 685.

Acid—Shake 1 Gm. of Betanaphthol with 100 cc. of water at frequent intervals for 15 minutes, and filter the mixture: the filtrate is neutral to litmus paper.

Alphanaphthol—Boil 100 mg. of Betanaphthol with 10 cc. of water until dissolved, allow the solution to cool, and then filter it: the addition to the filtrate of 0.3 cc. of normal sodium hydroxide, followed by 0.3 cc. of tenth-normal iodine, produces no violet color in the mixture.

Naphthalene or other organic impurities—Shake 500 mg. of Betanaphthol with 30 cc. of ammonia T.S.: it dissolves completely and the solution has a color not deeper than pale yellow.

Packaging and storage—Preserve Betanaphthol in well-closed, light-resistant containers.

AVERAGE DOSE—**0.12 Gm.** (approximately 2 grains).

Bismuth Potassium Tartrate

BISMUTH POTASSIUM TARTRATE

Bismuthi Potassii Tartras

Bism. Pot. Tart.—Potassium Bismuth Tartrate, Potassium Bismuthyl Tartrate

Bismuth Potassium Tartrate contains the equivalent of not less than 60 per cent and not more than 64 per cent of Bi.

Description—Bismuth Potassium Tartrate is a granular, white, odorless powder, having a sweetish taste. It darkens on exposure to light.

Solubility—One Gm. of Bismuth Potassium Tartrate dissolves in about 2 cc. of water. It is insoluble in alcohol, in ether, and in chloroform. It is decomposed by dilute mineral acids.

Identification—

A: Add ammonium sulfide T.S. to 5 cc. of a solution of Bismuth Potassium Tartrate (1 in 10): a brownish black precipitate is produced in the mixture.

B: Bismuth Potassium Tartrate imparts a violet color to a non-luminous flame.

C: Add a few drops of silver nitrate T.S. to 5 cc. of a solution of Bismuth Potassium Tartrate (1 in 10): a white precipitate is produced. Boil the mixture: it blackens and a silver mirror is formed.

Alcohol-soluble extractive—Add 1 Gm. of Bismuth Potassium Tartrate to 20 cc. of alcohol in a flask provided with a reflux condenser, and boil for 15 minutes. Filter, wash the residue on the filter with 5 cc. of alcohol, evaporate the combined filtrate and washings in a tared dish on a steam bath, and dry at 100°: the weight of the residue does not exceed 0.5 per cent.

Arsenic—Triturate intimately 200 mg. of Bismuth Potassium Tartrate with an equal weight of calcium hydroxide and ignite the mixture. Dissolve the residue in 5 cc. of diluted hydrochloric acid. Omitting the treatment with sulfurous and sulfuric acids, this solution meets the requirements of the test for *Arsenic*, page 618.

Lead—Ignite 3 Gm. of Bismuth Potassium Tartrate in a suitable crucible, cool, and add nitric acid, drop by drop, until the residue just dissolves upon warming. Pour the acid solution into 100 cc. of water. Filter, evaporate the filtrate on a water bath to about 30 cc., and again filter. A 5-cc. portion of the clear filtrate, when mixed with an equal volume of diluted sulfuric acid, shows no turbidity.

Assay—Dissolve about 300 mg. of Bismuth Potassium Tartrate, accurately weighed, in 25 cc. of water. Add 25 cc. of diluted nitric acid and stir until the precipitate which is formed at first redissolves. Add ammonia T.S. until a permanent, white precipitate results. Add 2 cc. of nitric acid, and dilute to 100 cc. with water. Heat the solution to boiling, and add gradually, with constant stirring, 50 cc. of a boiling solution containing 1.3 Gm. of dibasic ammonium phosphate in 100 cc. Digest the mixture for 1 hour at 80°, decant the clear, hot, supernatant liquid, and pass it through a previously prepared, tared Gooch crucible. Repeat the decantation three times, using for each washing 50 cc. of hot water containing about 3 per cent of ammonium nitrate. Transfer the precipitate to the Gooch crucible, using water to effect its complete removal from the beaker. Dry the crucible and contents, and ignite at a dull red heat for 30 minutes. Cool in a desiccator, and weigh. The weight of bismuth phosphate thus obtained, multiplied by 0.6876, represents the weight of Bi in the weight of Bismuth Potassium Tartrate taken for the assay.

Packaging and storage—Preserve Bismuth Potassium Tartrate in well-closed, light-resistant containers.

AVERAGE DOSE—Intramuscular, 0.1 Gm. (approximately $1\frac{1}{2}$ grains).

Bismuth Potassium Tartrate Injection

BISMUTH POTASSIUM TARTRATE INJECTION

Injectio Bismuthi Potassii Tartratis

Inj. Bism. Pot. Tart.

Bismuth Potassium Tartrate Injection is a sterile solution of bismuth potassium tartrate in water for injection or a sterile suspension of bismuth potassium tartrate in oil. It contains an amount of bismuth (Bi) equivalent to not less than 57 per cent and not more than 66 per cent of the labeled amount of bismuth potassium tartrate. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Bismuth Potassium Tartrate Injection, when an oil suspension, preferably by Process C. Sterilize Bismuth Potassium Tartrate Injection, when a water solution, preferably by Process C, or by Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

BISMUTH POTASSIUM TARTRATE INJECTION—WATER SOLUTION

Identification—The water Injection responds to *Identification tests*, *A*, *B*, and *C* under *Bismuth Potassium Tartrate*, page 77.

Assay—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, with water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 400 mg. of bismuth potassium tartrate, to a beaker, and, if necessary, dilute with water to about 25 cc. Then proceed as directed in the *Assay* of *Bismuth Potassium Tartrate*, page 77, beginning with "Add 25 cc. of diluted nitric acid and stir ...." The weight of the bismuth phosphate obtained, multiplied by 0.6876, represents the weight of bismuth in the volume of the Injection taken for the assay.

BISMUTH POTASSIUM TARTRATE INJECTION—OIL SUSPENSION

Identification—Transfer to a dry filter a sufficient volume of the suspension in oil to yield about 1 Gm. of bismuth potassium tartrate, and wash it with petroleum benzin until the oil is removed. Allow the benzin to evaporate from the filter, then dissolve the residue on the filter by adding, in small portions, hot water sufficient to make a 1 in 20 solution. This solution responds to *Identification tests A, B,* and *C* under *Bismuth Potassium Tartrate*, page 77.

Assay—Shake thoroughly the contents of the cylinder obtained in the *Determination of Volume of Injection in Containers*, page 665, and at once transfer with a pipette, calibrated to contain, an accurately measured volume of the suspension, equivalent to about 400 mg. of bismuth potassium tartrate, to a separator. Wash out the pipette with about 25 cc. of ether into the separator. Shake the suspension in the separator first with 20 cc. of diluted nitric acid, then with three successive portions of 15 cc. each of the acid, filtering the extracts through a small filter paper moistened with water, then wash the filter with 10 cc. of a mixture of equal volumes of diluted nitric acid and water. To the combined acid extracts contained in a beaker add ammonia T.S. until a slight but permanent precipitate is produced, then add 1 cc. of nitric acid, or more if necessary, until the solution is clear. Dilute with water to about 100 cc., then proceed as directed in the *Assay* of *Bismuth Potassium Tartrate*, page 77, beginning with "Heat the solution to boiling." The weight of the bismuth phosphate so obtained, multiplied by 0.6876, represents the weight of Bi in the volume of the Injection taken for the assay.

Storage—Preserve Bismuth Potassium Tartrate Injection preferably in single-dose hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light.

Labeling—The title on the label shall indicate whether the Injection is a water solution or an oil suspension.

Sizes—Bismuth Potassium Tartrate Injection usually available contains the following amounts of bismuth potassium tartrate: In water—30 mg. (½ grain) in 2 cc. In water—50 mg. (¾ grain) in 2 cc. In oil—100 mg. (1½ grains) in 2 cc. In oil—200 mg. (3 grains) in 2 cc.

AVERAGE DOSE OF BISMUTH POTASSIUM TARTRATE—Intramuscular, **0.1 Gm.** (approximately 1½ grains).

Bismuth Subcarbonate

BISMUTH SUBCARBONATE

Bismuthi Subcarbonas

Bism. Subcarb.—Basic Bismuth Carbonate

Bismuth Subcarbonate is a basic salt which, when dried over sulfuric acid for 18 hours, yields on ignition not less than 90 per cent of Bi_2O_3.

Description—Bismuth Subcarbonate is a white or pale yellowish white powder without odor and taste. It is stable in air, but is slowly affected by light.

Solubility—Bismuth Subcarbonate is insoluble in water and in alcohol.

Identification—Bismuth Subcarbonate is completely soluble in nitric or hydrochloric acid with copious effervescence. The solution in nitric acid responds to the tests for *Bismuth*, page 659.

Loss on drying—When dried over sulfuric acid for 18 hours, Bismuth Subcarbonate loses not more than 2 per cent of its weight.

Alkalies and earths—Mix 2 Gm. of Bismuth Subcarbonate with 40 cc. of a mixture of 1 volume of glacial acetic acid and 2 volumes of water and boil for 2 minutes. Cool, restore the volume to 40 cc. with water, and filter. Add 2 cc. of diluted hydrochloric acid to 20 cc. of the filtrate, and precipitate the bismuth by passing hydrogen sulfide through the solution, boil the mixture for 1 minute, and filter. Add to the filtrate 5 drops of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.

Chloride—One Gm. of Bismuth Subcarbonate shows no more *Chloride* than corresponds to 1 cc. of fiftieth-normal hydrochloric acid, page 709.

Nitrate—Agitate about 100 mg. of Bismuth Subcarbonate with 5 cc. of a mixture of equal volumes of water and ferrous sulfate T.S., and cautiously superimpose the mixture upon 5 cc. of sulfuric acid: no brownish red color appears at the zone of contact of the two liquids.

Dissolve 3 Gm. of Bismuth Subcarbonate in a sufficient quantity (about 4 cc.) of warm nitric acid, and pour the solution into 100 cc. of water: a white precipitate is produced. Filter, evaporate the filtrate on a water bath to 30 cc., again filter the liquid, divide the latter filtrate into portions of 5 cc. each, and use these several portions as test liquids for Sulfate, Copper, Lead, and Silver.

Sulfate—A portion of the test liquid is not at once visibly affected by a few drops of barium nitrate T.S.

Copper—To a portion of the test liquid, add a slight excess of ammonia T.S.: the supernatant liquid does not exhibit a bluish tint.

Lead—Mix another portion of the test liquid with an equal volume of diluted sulfuric acid: the liquid does not become cloudy.

Silver—In another portion of the test liquid, hydrochloric acid produces no precipitate which is insoluble in a slight excess of hydrochloric acid, but is soluble in ammonia T.S.

Arsenic—Dissolve 200 mg. of Bismuth Subcarbonate in a mixture of 2 cc. of sulfuric acid and 3 cc. of water: this solution meets the requirements of the test for *Arsenic*, page 618.

Assay—Dry about 1 Gm. of Bismuth Subcarbonate over sulfuric acid for 18 hours, weigh accurately in a tared porcelain crucible, and ignite to constant weight. The weight of Bi_2O_3 so obtained is not less than 90 per cent of the weight of dried Bismuth Subcarbonate taken for the assay.

Packaging and storage—Preserve Bismuth Subcarbonate in well-closed, light-resistant containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

Bismuth Subsalicylate

BISMUTH SUBSALICYLATE

Bismuthi Subsalicylas

Bism. Subsalicyl.—Basic Bismuth Salicylate

Bismuth Subsalicylate is a basic salt which, when dried over sulfuric acid for 18 hours, yields upon ignition not less than 62 per cent and not more than 66 per cent of Bi_2O_3.

Description—Bismuth Subsalicylate is a white or nearly white, amorphous, or microcrystalline, odorless powder. It is stable in air, but is affected by light.

Solubility—Bismuth Subsalicylate is practically insoluble in cold water.

Identification—

A: When heated, Bismuth Subsalicylate at first chars, leaving finally a yellow residue which is blackened by hydrogen sulfide. This residue responds to the tests for *Bismuth*, page 659.

B: Agitate about 100 mg. of Bismuth Subsalicylate with a solution of 5 drops of ferric chloride T.S. in 10 cc. of water: a deep violet blue mixture results.

Loss on drying—When dried over sulfuric acid for 18 hours, Bismuth Subsalicylate loses not more than 3 per cent of its weight.

Nitrate—Triturate about 50 mg. of Bismuth Subsalicylate with 100 mg. of sodium salicylate and 5 cc. of water, and superimpose the mixture upon 5 cc. of sulfuric acid: no pink or brownish red color appears at the zone of contact of the two liquids.

Free salicylic acid—Agitate 1 Gm. of Bismuth Subsalicylate with 20 cc. of chloroform, filter the liquid, and evaporate the filtrate to dryness: not more than 5 mg. of residue remains.

Alkalies and earths—Bismuth Subsalicylate meets the requirements of the test for *Alkalies and earths* under *Bismuth Subcarbonate*, page 79.

Arsenic—Triturate intimately 200 mg. of Bismuth Subsalicylate with an equal weight of calcium hydroxide, and ignite the mixture. Dissolve the residue in 5 cc. of diluted hydrochloric acid. Omitting the treatment with sulfurous and sulfuric acids, this solution meets the requirements of the test for *Arsenic*, page 618.

Other tests—Ignite 3 Gm. of Bismuth Subsalicylate in a porcelain crucible, cool, and add cautiously, dropwise, just sufficient nitric acid to dissolve the residue upon warming. Pour the acid solution into 100 cc. of water, filter, evaporate the filtrate on a water bath to 30 cc., again filter, and divide the filtrate into portions of 5 cc. each. These portions severally meet the requirements of the tests for *Sulfate, Copper, Lead,* and *Silver* under *Bismuth Subcarbonate*, page 79.

Assay—Dry about 1 Gm. of Bismuth Subsalicylate over sulfuric acid for 18 hours, and weigh accurately. Ignite in a porcelain crucible, and after cooling, add 5 cc. of nitric acid, drop by drop, to the residue, warming until solution has been effected. Evaporate this solution to dryness, and carefully ignite the residue to constant weight. The weight of Bi_2O_3 so obtained is not less than 62 per cent and not more than 66 per cent of the weight of dried Bismuth Subsalicylate taken for the assay.

Packaging and storage—Preserve Bismuth Subsalicylate in well-closed, light-resistant containers.

AVERAGE DOSE—

Oral, gastro-intestinal, **1 Gm.** (approximately 15 grains).

Intramuscular, in oil, anti-syphilitic, **0.1 Gm.** (approximately 1½ grains).

Bismuth Subsalicylate Injection

BISMUTH SUBSALICYLATE INJECTION

Injectio Bismuthi Subsalicylatis

Inj. Bism. Subsalicyl.

Bismuth Subsalicylate Injection is a sterile suspension of bismuth subsalicylate in oil. It contains an amount of bismuth (Bi) equivalent to not less than 53 per cent and not more than 62 per cent of the labeled amount of bismuth subsalicylate. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Bismuth Subsalicylate Injection preferably by Process C. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Transfer to a dry filter a sufficient volume of the Injection to yield about 1 Gm. of bismuth subsalicylate, wash it with petroleum benzin until the oil is

removed, and allow the benzin to evaporate from the filter. The residue responds to *Identification tests A* and *B* under *Bismuth Subsalicylate*, page 80.

Assay—Shake thoroughly the contents of the cylinder obtained in the *Determination of Volume of Injection in Containers*, page 665, and at once transfer with a pipette, calibrated to contain, an accurately measured volume of the suspension, equivalent to about 400 mg. of bismuth subsalicylate, to a separator. Wash out the pipette with about 25 cc. of ether into the separator. Shake the suspension in the separator first with 20 cc. of diluted nitric acid, then with three successive portions of 15 cc. each of the acid, filtering the extracts through a small filter paper moistened with water, then wash the filter with 10 cc. of a mixture of equal volumes of diluted nitric acid and water. To the combined acid extracts contained in a beaker add ammonia T.S. until a slight but permanent precipitate is produced, then add 1 cc. of nitric acid, or more if necessary, until the solution is clear. Dilute with water to about 100 cc., then proceed as directed in the *Assay* of *Bismuth Potassium Tartrate*, page 77, beginning with "Heat the solution to boiling." The weight of the bismuth phosphate so obtained, multiplied by 0.6876, represents the weight of Bi in the volume of the suspension taken for the assay.

Storage—Preserve Bismuth Subsalicylate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light.

Sizes—Bismuth Subsalicylate Injection usually available contains the following amounts of bismuth subsalicylate: 100 mg. (1½ grains) in 1 cc.; 120 mg. (2 grains) in 1 cc.

AVERAGE DOSE OF BISMUTH SUBSALICYLATE—Intramuscular, **0.1 Gm.** (approximately 1½ grains).

Boric Acid

BORIC ACID

Acidum Boricum

Acid. Boric.—Boracic Acid

H_3BO_3 **Mol. wt. 61.84**

Boric Acid, when dried over sulfuric acid for 5 hours, contains not less than 99.5 per cent of H_3BO_3.

Description—Boric Acid occurs as colorless, odorless scales of a somewhat pearly luster, as crystals or as a white powder, slightly unctuous to the touch. It is stable in air, and its solution is slightly acid to litmus paper.

Solubility—One Gm. of Boric Acid dissolves in 18 cc. of water, in 18 cc. of alcohol, and in 4 cc. of glycerin. One Gm. dissolves in 4 cc. of boiling water, and in 6 cc. of boiling alcohol.

Identification—Boric Acid responds to the tests for *Borate*, page 659.

Water-insoluble substances—One Gm. of Boric Acid dissolves in 25 cc. of water, producing a clear solution.

Alcohol-insoluble substances—One Gm. of Boric Acid dissolves completely in 10 cc. of boiling alcohol.

Arsenic—A solution of Boric Acid meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Dissolve 1 Gm. of Boric Acid in 23 cc. of water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Boric Acid is 20 parts per million

Assay—Dry about 2 Gm. of Boric Acid over sulfuric acid for 5 hours, weigh accurately, and dissolve the dried Acid in 100 cc. of a mixture of equal volumes of glycerin and water, previously neutralized to phenolphthalein T.S. Titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Discharge the pink color by the addition of 50 cc. of glycerin, neutralized to phenolphthalein T.S., and again titrate until the pink color reappears. Each cc. of normal sodium hydroxide is equivalent to 61.84 mg. of H_3BO_3.

Packaging and storage—Preserve Boric Acid in well-closed containers.

BORIC ACID OINTMENT

Unguentum Acidi Borici

Ung. Acid. Bor.— Boracic Acid Ointment

Boric Acid Ointment contains not less than 9 per cent and not more than 11 per cent of H_3BO_3.

Boric Acid, in very fine powder	100 Gm.
Wool Fat	50 Gm.
White Ointment	850 Gm.
To make	1000 Gm.

Levigate the boric acid with the wool fat to a smooth paste, and incorporate with the white ointment (see page 2).

Assay—Weigh accurately about 5 Gm. of Boric Acid Ointment in a tared Erlenmeyer flask of suitable capacity. Add 30 cc. of hot water, and heat for 15 minutes on a water bath with frequent agitation. Filter while hot through a wetted filter into a 100-cc. volumetric flask. Wash the Erlenmeyer flask with several portions of hot water, filtering the washings into the volumetric flask. Cool, dilute the filtrate with water to exactly 100 cc., and mix well. To exactly 20 cc. of the filtrate add 20 cc. of glycerin, previously neutralized to phenolphthalein T.S. Titrate with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Discharge the pink color by the addition of 20 cc. of glycerin, neutralized to phenolphthalein T S., and again titrate until the pink color reappears. Each cc. of tenth-normal sodium hydroxide is equivalent to 6.184 mg. of H_3BO_3.

Boroglycerin Glycerite

BOROGLYCERIN GLYCERITE

Glyceritum Boroglycerini

Glycer. Boroglyc.

Boroglycerin Glycerite contains not less than 47.5 per cent and not more than 52.5 per cent of boroglycerin ($C_3H_5BO_3$).

Boric Acid, in fine powder..........................	310 Gm.
Glycerin, a sufficient quantity,	
To make..........................	1000 Gm.

Heat 460 Gm. of glycerin in a tared porcelain dish on a sand bath to a temperature between 140° and 150°, and add the boric acid in portions, stirring constantly. When all of the boric acid is dissolved, maintain the liquid at the same temperature, frequently stirring it and breaking up the film which forms on the surface, until the mixture has been reduced to a weight of 500 Gm.; then add 500 Gm. of glycerin, mix thoroughly, and immediately transfer the product to suitable dry containers.

Reaction—Boroglycerin Glycerite turns moistened blue litmus paper red.

Assay—Weigh accurately into a flask of approximately 500-cc. capacity about 5 Gm. of Boroglycerin Glycerite. Add 100 cc. of a mixture of equal volumes of water and glycerin, previously neutralized to phenolphthalein T.S., and mix thoroughly. Titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Discharge the pink color by the addition of 50 cc. of glycerin, neutralized to phenolphthalein T.S., and again titrate until the pink color reappears. Each cc. of normal sodium hydroxide is equivalent to 99.89 mg. of $C_3H_5BO_3$.

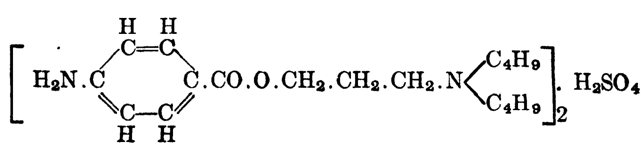
Packaging and storage—Preserve Boroglycerin Glycerite in tight containers.

Butacaine Sulfate

BUTACAINE SULFATE

Butacainæ Sulfas

Butacain. Sulf.



$(C_{18}H_{30}N_2O_2)_2H_2SO_4$ **Mol. wt. 710.95**

Description—Butacaine Sulfate occurs as a white, odorless, crystalline powder. It is affected by light. It rapidly produces numbness when placed upon the tongue. Its solution is practically neutral to litmus.

Solubility—Butacaine Sulfate dissolves slowly in less than its own weight of water, solution occurring more rapidly upon heating. It is very soluble in warm alcohol and in acetone, is slightly soluble in chloroform, and is insoluble in ether.
Melting range—Butacaine Sulfate melts between 100° and 103°, page 667.
Identification—

A: From solutions of Butacaine Sulfate, alkali hydroxides and carbonates precipitate the free base as a colorless oil, while solutions of alkali bicarbonates precipitate a crystalline carbonate of the base.

B: Separate portions of a solution of Butacaine Sulfate (1 in 10) yield a white precipitate with mercuric potassium iodide T.S., a brown precipitate with iodine T.S. and with gold chloride T.S., and a yellow precipitate with trinitrophenol T.S.

C: Dissolve about 100 mg. of Butacaine Sulfate in 5 cc. of water, and add 2 drops of diluted hydrochloric acid and 2 drops of a solution of sodium nitrite (1 in 10), then add the mixture to a solution of 200 mg. of betanaphthol in 10 cc. of a solution of sodium hydroxide (1 in 10): a scarlet red precipitate is formed (distinction from *phenacaine*, which yields a yellow precipitate).

D: A solution of Butacaine Sulfate (1 in 10) responds to the identity test for *Sulfate*, page 663.

Residue on ignition—Butacaine Sulfate yields not more than 0.2 per cent of residue on ignition, page 685.
Readily carbonizable substances—Dissolve 500 mg. of Butacaine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid G, page 680.
Packaging and storage—Preserve Butacaine Sulfate in tight, light-resistant containers.

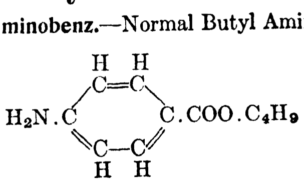
Butyl Aminobenzoate

BUTYL AMINOBENZOATE

Butylis Aminobenzoas

Butyl. Aminobenz.—Normal Butyl Aminobenzoate

$C_{11}H_{15}O_2N$



Mol. wt. 193.24

Description—Butyl Aminobenzoate occurs as a white, crystalline powder. It is odorless and tasteless.
Solubility—One Gm. of Butyl Aminobenzoate dissolves in about 7000 cc. of water. It is soluble in dilute acids, in alcohol, in chloroform, in ether, and in fatty oils. It is slowly hydrolyzed when boiled with water.
Melting range—Butyl Aminobenzoate melts between 57° and 59°, page 667.
Identification—

A: Add a few drops of a solution of sodium nitrite (1 in 10) to 2 cc. of a solution of Butyl Aminobenzoate in tenth-normal hydrochloric acid (1 in 100), and add the mixture to a solution of 200 mg. of betanaphthol in 10 cc. of a solution of sodium hydroxide (1 in 10): a scarlet red precipitate is produced.

B: To 1 cc. of a solution of Butyl Aminobenzoate in tenth-normal hydrochloric acid (1 in 100) add a few drops of iodine T.S., shake the mixture, and allow it to stand for 10 minutes with occasional shaking: a dark brown precipitate is formed which changes into large, reddish brown prisms (under the same conditions *ethyl aminobenzoate* gives lustrous scales).

Residue on ignition—Butyl Aminobenzoate yields not more than 0.15 per cent of residue on ignition, page 685.

Completeness and color of solution—Butyl Aminobenzoate dissolves completely in alcohol (1 in 30) and in ether (1 in 30), and the solutions are colorless.

Chloride—To a solution of 200 mg. of Butyl Aminobenzoate in 10 cc. of alcohol add 1 cc. of diluted nitric acid and a few drops of silver nitrate T.S.: no turbidity is produced.

Heavy metals—Dissolve 1 Gm. of Butyl Aminobenzoate in 2 cc. of diluted acetic acid and sufficient alcohol to make 25 cc.: the heavy metals limit, page 657, for Butyl Aminobenzoate is 10 parts per million.

Packaging and storage—Preserve Butyl Aminobenzoate in well-closed containers.

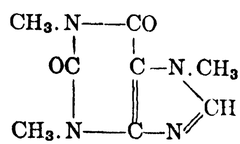
Caffeine

CAFFEINE

Caffeina

Caff.

$C_8H_{10}N_4O_2$



Mol. wt. 194.19

Caffeine is anhydrous, or contains not more than 8 per cent of water of hydration.

Description—Caffeine occurs as a white powder, or as white, glistening needles, usually matted together. It is odorless and has a bitter taste. The hydrate is efflorescent in air. Its solution is neutral to litmus paper.

Solubility—One Gm. of hydrous Caffeine is soluble in about 50 cc. of water, in 75 cc. of alcohol, in about 6 cc. of chloroform, and in 600 cc. of ether. One Gm. of it is soluble in 6 cc. of water at 80°, and in about 25 cc. of alcohol at 60°.

Melting range—Caffeine, rendered anhydrous by drying at about 80°, melts between 235° and 237.5°, page 667.

Identification—

A: Dissolve about 10 mg. of Caffeine in 1 cc. of hydrochloric acid in a porcelain dish, add 100 mg. of potassium chlorate, and evaporate to dryness on a water bath. Invert the dish over a vessel containing a few drops of ammonia T.S.: the residue acquires a purple color, which disappears upon the addition of a solution of a fixed alkali.

B: A saturated solution of Caffeine yields, with tannic acid T.S., a precipitate which is soluble in an excess of the reagent.

C: To 5 cc. of a saturated solution of Caffeine add 5 drops of iodine T.S.: no precipitate is produced. Now add 3 drops of diluted hydrochloric acid: a red-brown precipitate is produced, which redissolves when a slight excess of sodium hydroxide T.S. is added.

Loss on drying—Anhydrous Caffeine loses not more than 0.5 per cent, and the hydrate loses not more than 8 per cent of its weight when dried for 6 hours at 80°.

Residue on ignition—Caffeine yields not more than 0.1 per cent of residue on ignition, page 685.

Heavy metals—Mix 1 Gm. of Caffeine with 5 cc. of tenth-normal hydrochloric acid and 45 cc. of water, and warm gently until solution is complete, then cool to room temperature. Use 25 cc. of this solution for the test: the heavy metals limit, page 657, for Caffeine is 20 parts per million.

Readily carbonizable substances—Dissolve 500 mg. of Caffeine in 5 cc. of sulfuric acid: the solution has no more color than matching fluid D, page 680.

Other alkaloids—No precipitate is produced by mercuric potassium iodide T.S. in a solution of Caffeine (1 in 50).

Packaging and storage—Preserve hydrous Caffeine in tight containers. Anhydrous caffeine may be preserved in well-closed containers.

Labeling—The label shall declare whether the Caffeine is anhydrous or hydrous. When the quantity of Caffeine is indicated in the labeling of any preparation of Caffeine, this shall be in terms of anhydrous Caffeine.

AVERAGE DOSE—**0.2 Gm.** (approximately 3 grains).

CAFFEINE AND SODIUM BENZOATE

Caffeina et Sodii Benzoas

Caff. et Sod. Benz.—Caffeine with Sodium Benzoate, Caffeine Sodio-Benzoate

Caffeine and Sodium Benzoate is a mixture of caffeine and sodium benzoate which contains, when dried at 80° to constant weight, not less than 47 per cent and not more than 50 per cent of anhydrous caffeine ($C_8H_{10}N_4O_2$); and not less than 50 per cent and not more than 53 per cent of sodium benzoate ($NaC_7H_5O_2$). The sum of the percentages of anhydrous caffeine and sodium benzoate is not less than 98 and not more than 102.

Description—Caffeine and Sodium Benzoate occurs as a white, odorless powder and has a slightly bitter taste.

Solubility—One Gm. of Caffeine and Sodium Benzoate dissolves in 1.2 cc. of water, a portion of the caffeine usually separating on standing, and in about 30 cc. of alcohol. It is slightly soluble in chloroform.

Identification—

A: Dissolve about 10 mg. of the caffeine obtained in the *Assay for caffeine* in 1 cc. of hydrochloric acid in a porcelain dish, add 100 mg. of potassium chlorate, and evaporate to dryness on a water bath. Invert the dish over a vessel containing a few drops of ammonia T.S.: the residue acquires a purple color, which disappears upon the addition of a solution of a fixed alkali.

B: When heated, Caffeine and Sodium Benzoate decomposes, evolving white vapors of caffeine, and leaving a residue which effervesces when treated with an acid, and imparts an intensely yellow color to a non-luminous flame.

C: To a solution of Caffeine and Sodium Benzoate (1 in 10) add a few drops of ferric chloride T.S.: a salmon-colored precipitate appears in the mixture. To another portion of the solution add diluted hydrochloric acid: a white precipitate is formed.

D: The residue obtained in the *Assay for caffeine* directed below, when recrystallized from hot water and dried to constant weight at 80°, melts between 235° and 237.5°, page 667.

Loss on drying—When dried to constant weight at 80°, Caffeine and Sodium Benzoate loses not more than 3 per cent of its weight.

Chlorinated compounds—Dissolve about 2 Gm. of Caffeine and Sodium Benzoate in 40 cc. of water in a separator, add 10 cc. of diluted sulfuric acid, extract the liberated benzoic acid with two successive 10-cc. portions of ether, and allow the combined ether solutions to evaporate to dryness at room temperature. Five hundred milligrams of the benzoic acid so obtained meets the requirements of the test for *Chlorinated compounds* as directed under *Benzoic Acid*, page 70.

Free alkali—A solution of Caffeine and Sodium Benzoate (1 in 20) may be neutral, slightly acid, or slightly alkaline to litmus paper, but it is not reddened by phenolphthalein T.S.

Heavy metals—Dissolve 2 Gm. of Caffeine and Sodium Benzoate in 47 cc. of water. Add slowly, with vigorous stirring, 3 cc. of diluted hydrochloric acid, and filter, rejecting the first 5 cc. of filtrate: the heavy metals limit, page 657, for Caffeine and Sodium Benzoate, determined upon 25 cc. of the filtrate, is 20 parts per million.

Readily carbonizable substances—Dissolve 500 mg. of Caffeine and Sodium Benzoate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Assay for caffeine—Weigh accurately about 1 Gm. of Caffeine and Sodium Benzoate, previously dried to constant weight at 80°, and dissolve it in 10 cc. of water in a separator. Add 1 drop of phenolphthalein T.S. and tenth-normal sodium hydroxide, drop by drop, until a permanent pink color is just produced. Shake the mixture with three or more successive portions of 20 cc. each of chloroform to effect complete extraction. Retain the water layer for the *Assay for sodium benzoate*. Filter the combined chloroform solutions through a small filter, previously moistened with chloroform, into a tared dish. Wash the stem of the separator, the filter, and the funnel with 10 cc. of hot chloroform, adding the washings to the dish, and evaporate the combined chloroform solutions on a water bath, adding 2 cc. of alcohol just before the last trace of chloroform is expelled. Complete the evaporation of the solvent, and dry the residue, consisting of $C_8H_{10}N_4O_2$, to constant weight at 80°.

Assay for sodium benzoate—Completely transfer the water solution from which the caffeine has been removed, as directed in the *Assay for caffeine*, to a tall beaker of about 300-cc. capacity, and add 75 cc. of ether and 5 drops of methyl orange T.S. Titrate the mixture with tenth-normal hydrochloric acid, mixing the liquids intimately by vigorous stirring, until a permanent pink color is produced in the water layer. Each cc. of tenth-normal hydrochloric acid is equivalent to 14.41 mg. of $NaC_7H_5O_2$.

Packaging and storage—Preserve Caffeine and Sodium Benzoate in well-closed containers.

AVERAGE DOSE—Oral or intramuscular, **0.5 Gm.** (approximately 7½ grains).

CAFFEINE AND SODIUM BENZOATE INJECTION

Injectio Caffeinæ et Sodii Benzoatis

Inj. Caff. et Sod. Benz.

Caffeine and Sodium Benzoate Injection is a sterile solution of caffeine and sodium benzoate in water for injection. It contains an amount of anhydrous caffeine ($C_8H_{10}N_4O_2$) equivalent to not less than 45 per cent and not more than 52 per cent, and an amount of sodium benzoate ($NaC_7H_5O_2$) equivalent to not less than 47.5 per cent and not more than 55.5 per cent of the labeled amount of caffeine and sodium benzoate. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Caffeine and Sodium Benzoate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—The injection responds to *Identification tests A, C,* and *D* under *Caffeine and Sodium Benzoate*, page 87. When the end of a platinum wire is dipped in the Injection and introduced into a non-luminous flame, the flame is colored intensely yellow.

Assay for caffeine—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, with water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 400 mg. of caffeine and sodium benzoate, to a small separator, add about 5 cc. of water and 1 drop of phenolphthalein T.S., then add tenth-normal sodium hydroxide, drop by drop, until a slight, permanent pink color is produced. Shake the solution with three or more successive portions of chloroform until the caffeine is completely extracted, passing each chloroform extract through a filter previously moistened with chloroform. (Retain the water layer for the *Assay for sodium benzoate*). Wash the stem of the separator and the filter with a few cc. of warm chloroform to remove any adhering caffeine, and add these washings to the chloroform extracts. Evaporate the combined chloroform solution in a tared beaker or flask nearly to dryness on a water bath, then add 2 cc. of alcohol, evaporate to dryness, and dry to constant weight at 80°.

Assay for sodium benzoate—To the water layer in the separator, obtained in the *Assay for caffeine*, above, add 50 cc. of ether and a few drops of methyl orange T.S., and titrate with tenth-normal hydrochloric acid while intimately mixing the water and ether layers by vigorous shaking, until a permanent pink color is produced in the water layer. Each cc. of tenth-normal hydrochloric acid is equivalent to 14.41 mg. of $NaC_7H_5O_2$.

Packaging and storage—Preserve Caffeine and Sodium Benzoate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Caffeine and Sodium Benzoate Injection usually available contains the following amounts of caffeine and sodium benzoate: 250 mg. (4 grains) in 2 cc.; 500 mg. (7½ grains) in 2 cc.

AVERAGE DOSE OF CAFFEINE AND SODIUM BENZOATE—Intramuscular, **0.5 Gm.** (approximately 7½ grains).

Caffeine, Citrated

CITRATED CAFFEINE

Caffeina Citrata

Caff. Cit.

Citrated Caffeine is a mixture of caffeine and citric acid containing, when dried to constant weight at 80°, not less than 48 per cent and not more than 52 per cent of anhydrous caffeine ($C_8H_{10}N_4O_2$), and not less than 48 per cent and not more than 52 per cent of anhydrous citric acid ($C_6H_8O_7$). The sum of the percentages of anhydrous caffeine and anhydrous citric acid is not less than 98.5 and not more than 101.

Description—Citrated Caffeine occurs as a white, odorless powder, having a slightly bitter, acid taste. Its solutions are acid to litmus paper.

Solubility—One Gm. of Citrated Caffeine dissolves in 4 cc. of warm water. On diluting the solution with an equal volume of water, a portion of the caffeine gradually separates, but redissolves on the further addition of water.

Identification—

A: Dissolve about 20 mg. of Citrated Caffeine in 1 cc. of hydrochloric acid in a porcelain dish, add 100 mg. of potassium chlorate, and evaporate to dryness on a water bath. Invert the dish over a vessel containing a few drops of ammonia T.S.: the residue acquires a purple color, which disappears upon the addition of a solution of a fixed alkali.

B: Dissolve about 100 mg. of Citrated Caffeine in 10 cc. of water, and add 1 cc. of calcium chloride T.S. and 3 drops of bromothymol blue T.S. Add tenth-normal sodium hydroxide, drop by drop, until the color of the solution just changes to a clear blue, then boil the solution gently for 3 minutes, agitating it gently during the heating period: a white, crystalline precipitate appears in the liquid.

C: Add 1 cc. of mercuric sulfate T.S. to 5 cc. of a solution of Citrated Caffeine (1 in 100), heat the mixture to boiling, and add 1 cc. of potassium permanganate T.S.: a white precipitate appears.

D: The residue obtained in the *Assay for caffeine*, when recrystallized from hot water and dried to constant weight at 80°, melts between 235° and 237.5°, page 667.

Loss on drying—Citrated Caffeine loses not more than 5 per cent of its weight when dried to constant weight at 80°.

Residue on ignition—Citrated Caffeine yields not more than 0.1 per cent of residue on ignition, page 685.

Heavy metals—Dissolve 1 Gm. of Citrated Caffeine in 15 cc. of water, and dilute to 25 cc.: the heavy metals limit, page 657, for Citrated Caffeine is 15 parts per million.

Readily carbonizable substances.—Heat a mixture of 250 mg. of Citrated Caffeine and 5 cc. of sulfuric acid in a porcelain dish on a water bath for 15 minutes, protecting it from dust: the color is not darker than matching fluid K, page 680.

Assay for caffeine—Accurately weigh about 1 Gm. of Citrated Caffeine, previously dried to constant weight at 80°, and dissolve it in 10 cc. of hot water. Add 8 cc. of sodium hydroxide T.S., cool the solution, and shake it in a separator with three or more successive portions of 20 cc. each of chloroform to effect complete extraction of the caffeine. Filter the combined chloroform solutions through a small filter, previously moistened with chloroform, into a tared dish. Wash the stem of the separator, the filter, and the funnel with 10 cc. of hot chloroform, adding the washings to the dish, and evaporate the combined chloroform solutions on a water bath, adding 2 cc. of alcohol just before the last trace of chloroform is expelled.

Complete the evaporation of the solvent, and dry the residue, consisting of $C_8H_{10}N_4O_2$, to constant weight at 80°.

Assay for citric acid.—Weigh accurately about 400 mg. of Citrated Caffeine, previously dried to constant weight at 80°, and dissolve it in 25 cc. of water. Add 3 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide to a faint pink color. Each cc. of tenth-normal sodium hydroxide is equivalent to 6.404 mg. of $C_6H_8O_7$.

Packaging and storage—Preserve Citrated Caffeine in tight containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Calamine

CALAMINE

Calamina

Calam.

Calamine is zinc oxide with a small amount of ferric oxide, and contains, after ignition, not less than 98 per cent of ZnO.

Description—Calamine is a pink, odorless, and almost tasteless powder. It will pass through a No. 100 standard mesh sieve.

Solubility—Calamine is insoluble in water, but is almost completely soluble in mineral acids.

Identification—

A: Treat 1 Gm. of Calamine with 10 cc. of diluted hydrochloric acid, and filter: the filtrate responds to the test for *Zinc*, page 664.

B: Treat 1 Gm. of Calamine with 10 cc. of diluted hydrochloric acid, heat to boiling, and filter: the filtrate assumes a reddish color on the addition of ammonium thiocyanate T.S.

Loss on ignition—Ignite 500 mg. of Calamine: the loss in weight does not exceed 10 mg.

Acid-insoluble substances—Dissolve 2 Gm. of Calamine in 50 cc. of diluted hydrochloric acid. If an insoluble residue remains, collect it on a tared filter, wash it with water, dry at 100° for 2 hours, cool, and weigh. The weight does not exceed 40 mg.

Alkaline substances—Digest 1 Gm. of Calamine with 20 cc. of water on a steam bath for 15 minutes, filter, and add 2 drops of phenolphthalein T.S.: if a red color is produced, it requires not more than 0.2 cc. of tenth-normal sulfuric acid to discharge it.

Calcium—Dissolve 1 Gm. of Calamine in 25 cc. of diluted hydrochloric acid, filter, and add ammonia T.S. to the filtrate until the precipitate first formed is redissolved; then add 5 cc. more of ammonia T.S. To 10 cc. of this solution add 2 cc. of ammonium oxalate T.S.: not more than a slight turbidity is produced.

Calcium or magnesium—To another 10 cc. portion of the solution from the preceding test add 2 cc. of sodium phosphate T.S.: not more than a slight turbidity is produced.

Arsenic—Dissolve 200 mg. of Calamine in 5 cc. of diluted sulfuric acid: the solution, without further treatment with sulfuric or sulfurous acid, meets the requirements of the test for *Arsenic*, page 618.

Lead—To 1 Gm. of Calamine add 15 cc. of water and stir well; then add 3 cc. of glacial acetic acid, warm on a water bath until dissolved, and filter: on the addition of 5 drops of potassium chromate T.S. to the filtrate no turbidity is produced.

Assay—Digest about 1.5 Gm. of freshly ignited Calamine, accurately weighed, with 50 cc. of normal sulfuric acid, applying gentle heat until no further solution occurs.

Filter the mixture and wash the residue on the filter with hot water until the washings are neutral to litmus paper. Combine the original filtrate and subsequent washings, add 2.5 Gm. of ammonium chloride, cool, and titrate with normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 40.69 mg. of ZnO.

Packaging and storage—*Preserve Calamine in well-closed containers.*

Calamine Lotion

CALAMINE LOTION

Lotio Calaminæ

Lot. Calam.

Calamine	80 Gm.
Zinc Oxide	80 Gm.
Glycerin	20 cc.
Bentonite Magma	400 cc.
Calcium Hydroxide Solution, a sufficient quantity,	
To make	1000 cc.

Dilute the bentonite magma with an equal volume of calcium hydroxide solution. Mix the powders intimately with the glycerin and about 100 cc. of the diluted magma to a smooth, uniform paste. Gradually incorporate the remainder of the diluted magma. Finally add enough calcium hydroxide solution to make 1000 cc., and shake well.

Note—Shake Calamine Lotion thoroughly before dispensing.

Packaging and storage—Preserve Calamine Lotion in tight containers.

Calcium Carbonate, Precipitated

PRECIPITATED CALCIUM CARBONATE

Calcii Carbonas Præcipitatus

Calc. Carb. Præc.—Precipitated Chalk

$CaCO_3$ Mol. wt. 100.09

Precipitated Calcium Carbonate, when dried at 200° for 4 hours, contains not less than 98.5 per cent of $CaCO_3$.

Description—Precipitated Calcium Carbonate is a fine, white, microcrystalline powder, without odor or taste. It is stable in air.

Solubility—Precipitated Calcium Carbonate is practically insoluble in water. Its solubility in water is increased by the presence of any ammonium salt and by the presence of carbon dioxide. The presence of any alkali hydroxide reduces its solu-

bility. It is insoluble in alcohol. It dissolves with effervescence in diluted acetic, in diluted hydrochloric, and in diluted nitric acids.

Identification—The addition of acetic acid to Precipitated Calcium Carbonate produces effervescence, and the resulting solution, after boiling and neutralizing with ammonia T.S., responds to the tests for *Calcium*, page 659.

Loss on drying—When dried at 200° for 4 hours, Precipitated Calcium Carbonate loses not more than 2 per cent of its weight.

Acid-insoluble substances—Mix 5 Gm. of Precipitated Calcium Carbonate with 10 cc. of water and add hydrochloric acid, dropwise, with agitation, until it ceases to cause effervescence, then add sufficient water to make the mixture measure 200 cc., and filter. Wash the insoluble residue with water until the last washing shows no chloride, and then ignite it: the weight of the residue does not exceed 10 mg.

Barium—A platinum wire, dipped in the filtrate obtained in the test for *Acid-insoluble substances* and held in a non-luminous flame, does not impart a green color.

Heavy metals—Mix 1 Gm. of Precipitated Calcium Carbonate with 5 cc. of water, add slowly 8 cc. of diluted hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 20 cc. of water, and filter. Dilute the filtrate to 23 cc. with water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Precipitated Calcium Carbonate is 30 parts per million.

Magnesium and alkali salts—Dissolve 1 Gm. of Precipitated Calcium Carbonate in a mixture of 20 cc. of water and 10 cc. of diluted hydrochloric acid. Heat to boiling, neutralize with ammonia T.S., and completely precipitate the calcium by the addition of ammonium oxalate T.S. Heat the mixture on a water bath for 1 hour, cool, dilute to 100 cc. with water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness in a platinum dish. Ignite to constant weight: the weight of the residue does not exceed 5 mg.

Assay—Dry about 250 mg. of Precipitated Calcium Carbonate at 200° for 4 hours, weigh accurately, dissolve it in a mixture of 10 cc. of diluted hydrochloric acid and 10 cc. of water in a 250-cc. beaker, and boil the solution to expel all carbon dioxide. Add 100 cc. of water, heat the mixture to boiling, make the solution alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat the mixture on a water bath during 1 hour, filter through hardened filter paper, and wash with small portions of warm water until the washings give no turbidity within 1 minute upon the addition of calcium chloride T.S. Puncture the filter paper, and wash the precipitate into a beaker by means of hot water, followed by 30 cc. of dilute sulfuric acid (1 in 3). Heat the solution to 80° and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal-potassium permanganate is equivalent to 5.005 mg. of $CaCO_3$.

Packaging and storage—Preserve Precipitated Calcium Carbonate in well-closed containers.

AVERAGE DOSE— **1 Gm.** (approximately 15 grains).

CALCIUM CHLORIDE

Calcii Chloridum

Calc. Chlorid.

$CaCl_2.2H_2O$ Mol. wt. 147.03

Calcium Chloride contains not less than 75 per cent and not more than 81 per cent of $CaCl_2$.

Description—Calcium Chloride occurs as white, hard, odorless fragments or granules. It is deliquescent.
Solubility—One Gm. of Calcium Chloride dissolves in 1.2 cc. of water, and in about 10 cc. of alcohol. One Gm. of it dissolves in 0.7 cc. of boiling water, and in about 2 cc. of boiling alcohol.
Identification—A solution of Calcium Chloride (1 in 10) responds to the tests for *Calcium*, page 659, and for *Chloride*, page 659.
Reaction—Dissolve 3 Gm. of Calcium Chloride in 20 cc. of freshly boiled and cooled water and add 2 drops of phenolphthalein T.S. If the solution is pink, it requires not more than 0.1 cc. of fiftieth-normal hydrochloric acid to discharge the pink color. If the solution is not pink, it requires not more than 0.1 cc. of fiftieth-normal sodium hydroxide to produce a pink color.
Heavy metals—Dissolve 1 Gm. of Calcium Chloride in 2 cc. of diluted acetic acid, and add sufficient water to make 25 cc.: the heavy metals limit, page 657, for Calcium Chloride is 20 parts per million.
Iron, aluminum, or phosphate—Add enough ammonia T.S. to a solution of Calcium Chloride (1 in 20) to render it alkaline, and heat the liquid to boiling: no turbidity or precipitate is produced.
Magnesium and alkali salts—Dissolve 1 Gm. of Calcium Chloride in about 40 cc. of water and add 500 mg. of ammonium chloride. Heat the solution to boiling, and add ammonium oxalate T.S. to precipitate the calcium completely. Heat on a water bath for 1 hour, cool, dilute to 100 cc. with water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.
Assay—Dissolve about 200 mg. of Calcium Chloride, accurately weighed in a tared, glass-stoppered weighing bottle, in about 100 cc. of water, and proceed with the assay as directed under *Precipitated Calcium Carbonate*, page 92, beginning with the words "heat the mixture to boiling, make the solution alkaline with ammonia T.S.," etc. Each cc. of tenth-normal potassium permanganate is equivalent to 5.55 mg. of $CaCl_2$.
Packaging and storage—Preserve Calcium Chloride in tight containers.

Calcium Gluconate

CALCIUM GLUCONATE

Calcii Gluconas

Calc. Glucon.

$Ca(C_6H_{11}O_7)_2.H_2O$ $[CH_2OH(CHOH)_4.COO]_2Ca.H_2O$ Mol. wt. 448.39

Calcium Gluconate contains not less than 8.8 per cent and not more than 9.3 per cent of calcium (Ca), corresponding to not less than 99 per cent of $Ca(C_6H_{11}O_7)_2.H_2O$.

Description—Calcium Gluconate occurs as a white, crystalline or granular powder without odor or taste. It is stable in air. Its solutions are neutral to litmus paper.
Solubility—One Gm. of Calcium Gluconate dissolves slowly in about 30 cc. of water, and in about 5 cc. of boiling water. It is insoluble in alcohol and in many other organic solvents.

Identification—

A: A solution of Calcium Gluconate (1 in 50) responds to the tests for *Calcium*, page 659.

B: To 5 cc. of a warm solution of Calcium Gluconate (1 in 10) add 0.65 cc. of glacial acetic acid and 1 cc. of freshly distilled phenylhydrazine, and heat the mixture on a water bath for 30 minutes. Allow the solution to cool, and scratch the inner surface of the tube with a glass stirring rod. Crystals of gluconic-acid-phenylhydrazide form.

Chloride—One Gm. of Calcium Gluconate shows no more *Chloride* than corresponds to 1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 2-Gm. portion of Calcium Gluconate shows no more *Sulfate* than corresponds to 1 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic—Dissolve 250 mg. of Calcium Gluconate in 5 cc. of warm water, add 5 cc. of diluted sulfuric acid and 1 cc. of bromine T.S., and heat for 5 minutes on a water bath: the solution meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Mix 1 Gm. of Calcium Gluconate with 4 cc. of normal hydrochloric acid, dilute to 25 cc. with water, warm gently until dissolved, and cool to room temperature: the heavy metals limit, page 657, for Calcium Gluconate is 20 parts per million.

Sucrose and reducing sugars—Dissolve 500 mg. of Calcium Gluconate in 10 cc. of hot water, add 2 cc. of diluted hydrochloric acid, and boil the solution for about 2 minutes. Cool, add 5 cc. of sodium carbonate T.S., allow to stand for 5 minutes, dilute to 20 cc. with water, and filter. Add 5 cc. of the clear filtrate to about 2 cc. of alkaline cupric tartrate T.S., and boil for 1 minute: no red precipitate is formed.

Assay—Weigh accurately about 500 mg. of Calcium Gluconate, place it in a beaker, and add 2 cc. of hydrochloric acid and 100 cc. of water. Heat the mixture to boiling, make the solution alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat the mixture on a water bath during 1 hour, filter through hardened filter paper, and wash with small portions of warm water until the washings give no turbidity within 1 minute with Calcium Chloride T.S. Puncture the filter paper, wash the precipitate into a beaker by means of a stream of hot water, followed by 30 cc. of dilute (1 in 3) sulfuric acid. Heat the solution to 80°, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 2.004 mg. of Ca.

Packaging and storage—Preserve Calcium Gluconate in well-closed containers.

AVERAGE DOSE—

Oral, **5 Gm.** (approximately 75 grains).

Intramuscular or intravenous, **1 Gm.** (approximately 15 grains)

CALCIUM GLUCONATE INJECTION

Injectio Calcii Gluconatis

Inj. Calc. Glucon.

Calcium Gluconate Injection is a sterile solution of calcium gluconate in water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of $Ca(C_6H_{11}O_7)_2.H_2O$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Calcium Gluconate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Calcium *d*-saccharate, or other calcium salts, may be added as stabilizers. The amount of such added calcium salts, calculated as calcium (Ca), does not exceed 5 per cent of the calcium (Ca) present as calcium gluconate. To insure greater stability of the Injection, sufficient sodium hydroxide may be added to produce a pH not above 8.2.

Identification—The Injection responds to *Identification tests A* and *B* under *Calcium Gluconate*, page 94.

Assay—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, with water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 500 mg. of calcium gluconate, to a beaker, add 2 cc. of hydrochloric acid and 100 cc. of water, and heat to boiling. Make the solution alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat on a water bath for 1 hour, then filter through a hardened filter paper, and wash the precipitate thoroughly with small portions of warm water until the last washing gives no reaction for oxalate. Puncture the filter paper, and wash the precipitate into a beaker with a stream of hot water, then follow with 30 cc. of dilute (1 in 3) sulfuric acid. Heat the solution to 80°, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 22.42 mg. of $Ca(C_6H_{11}O_7)_2H_2O$. Correct the result for any added substances containing calcium.

Packaging and storage—Preserve Calcium Gluconate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Calcium Gluconate Injection usually available contains the following amount of calcium gluconate: 1 Gm. (15 grains) in 10 cc.

AVERAGE DOSE OF CALCIUM GLUCONATE—Intramuscular or intravenous, **1 Gm.** (approximately 15 grains).

Calcium Hydroxide

CALCIUM HYDROXIDE

Calcii Hydroxidum

Calc. Hydrox.—Slaked Lime

$Ca(OH)_2$ **Mol. wt. 74.10**

Calcium Hydroxide contains not less than 95 per cent of $Ca(OH)_2$.

Description—Calcium Hydroxide occurs as a soft, white, crystalline powder, possessing an alkaline, slightly bitter taste.

Solubility—One Gm. of Calcium Hydroxide dissolves in 630 cc. of water, and in 1300 cc. of boiling water. It is soluble in glycerin and in syrup, but is insoluble in alcohol.

Identification—

A: When mixed with from 3 to 4 times its weight of water, Calcium Hydroxide forms a smooth magma. The clear, supernatant liquid from the magma is distinctly alkaline to litmus paper.

B: Dissolve 1 Gm. of Calcium Hydroxide in 20 cc. of water by the addition of sufficient acetic acid to effect solution: the resulting solution responds to the tests for *Calcium*, page 659.

Hydrochloric acid-insoluble matter—Dissolve 2 Gm. of Calcium Hydroxide in 10 cc. of hydrochloric acid, previously mixed with 20 cc. of water, and heat to boiling. Filter the mixture, wash the residue with hot water, and ignite: the weight of the residue does not exceed 10 mg.

Carbonate—Thoroughly mix 2 Gm. of Calcium Hydroxide with 50 cc. of water: the addition of an excess of diluted hydrochloric acid to the mixture does not cause more than a slight effervescence.

Heavy metals—Dissolve 1 Gm. of Calcium Hydroxide in 10 cc. of diluted hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 20 cc. of water, and filter. Add 1 cc. of tenth-normal hydrochloric acid and sufficient water to make 25 cc.: the heavy metals limit, page 657, for Calcium Hydroxide is 40 parts per million.

Magnesium and alkali salts—Dissolve 500 mg. of Calcium Hydroxide in 20 cc. of water and 10 cc. of diluted hydrochloric acid. Neutralize with ammonia T.S., heat to boiling, and add ammonium oxalate T.S. to precipitate the calcium completely. Heat the mixture on a steam bath for 1 hour, cool, dilute to 100 cc. with water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 12 mg.

Assay—Completely transfer about 1 Gm. of Calcium Hydroxide, accurately weighed, to a 100-cc. volumetric flask with the aid of water. Gradually add 10 cc. of hydrochloric acid to dissolve the Calcium Hydroxide, cool, dilute with water to make 100 cc., and mix well. Transfer exactly 10 cc. of the solution to a beaker, and proceed with the assay as directed under *Precipitated Calcium Carbonate*, page 92, beginning with the words "Add 100 cc. of water," etc. Each cc. of tenth-normal potassium permanganate is equivalent to 3.705 mg. of $Ca(OH)_2$.

Packaging and storage—Preserve Calcium Hydroxide in tight containers.

Calcium Hydroxide Solution

CALCIUM HYDROXIDE SOLUTION

Liquor Calcii Hydroxidi

Liq. Calc. Hydrox.—Liquor Calcis, Lime Water

Calcium Hydroxide Solution is a solution containing, in each 100 cc., at 25°, not less than 0.14 Gm. of $Ca(OH)_2$. The content of calcium hydroxide varies with the temperature at which the solution is stored, being about 0.17 Gm. per 100 cc. at 15°, and less at a higher temperature.

Calcium Hydroxide Solution may be prepared as follows:

Calcium Hydroxide..................................	3 Gm.
Distilled Water, a sufficient quantity	

Add the calcium hydroxide to 1000 cc. of cool distilled water, and agitate the mixture vigorously and repeatedly during 1 hour. Allow the

excess calcium hydroxide to settle. Dispense only the clear, supernatant liquid.

The undissolved portion of the mixture is not suitable for preparing additional quantities of Calcium Hydroxide Solution.

Description—Calcium Hydroxide Solution is a clear, colorless liquid with an alkaline taste. It is strongly alkaline to litmus.

Identification—

A: Calcium Hydroxide Solution absorbs carbon dioxide from the air, a film of calcium carbonate forming on the surface of the liquid.

B: When heated, it becomes turbid, owing to the separation of calcium hydroxide.

Alkalies and their carbonates—A portion of Calcium Hydroxide Solution, saturated with carbon dioxide and subsequently boiled, is no longer alkaline in reaction.

Assay—Measure accurately 50 cc. of Calcium Hydroxide Solution at 25°, and titrate with tenth-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal hydrochloric acid is equivalent to 3.705 mg. of $Ca(OH)_2$.

Packaging and storage—Preserve Calcium Hydroxide Solution in well-filled, tight containers.

AVERAGE DOSE— **15 cc.** (approximately 4 fluidrachms).

Calcium Iodobehenate

CALCIUM IODOBEHENATE

Calcii Iodobehenas

Calc. Iodobehen.—Calcium Monoiodobehenate

Calcium Iodobehenate consists principally of calcium monoiodobehenate [$(C_{21}H_{42}ICOO)_2Ca$] and contains, when dried at 100° for 2 hours, not less than 23.5 per cent of I.

Description—Calcium Iodobehenate occurs as a white or yellowish powder, which is unctuous to the touch. It is odorless or has a slight odor suggestive of fat. It is affected by light.

Solubility—Calcium Iodobehenate is insoluble in water, very slightly soluble in alcohol and in ether, and freely soluble in warm chloroform.

Identification—When strongly heated, Calcium Iodobehenate decomposes, yielding violet vapors of iodine, and white vapors having the odor of burning fat. The ash thus obtained, dissolved in diluted hydrochloric acid, boiled, and neutralized with ammonia T.S., responds to the tests for *Calcium*, page 659.

Loss on drying—Calcium Iodobehenate loses not more than 2 per cent of its weight when dried at 100° for 2 hours.

Reaction and soluble salts—Triturate 1 Gm. of Calcium Iodobehenate with 10 cc. of water: the mixture is neutral to litmus paper. Add 15 cc. more of water, mix well during 5 minutes, and filter. Evaporate 10 cc. of the filtrate to dryness on a water bath, and dry to constant weight at 120°: the weight of the residue does not exceed 1 mg.

Carbonate—To 1 Gm. of Calcium Iodobehenate add 10 cc. of diluted hydrochloric acid: the mixture does not effervesce.

Chloride and sulfate—Separate 5-cc. portions of the filtrate obtained from the test for *Soluble salts* when tested for *Chloride* (page 709) and for *Sulfate* (page 709),

produce no more turbidity than does 0.1 cc. of fiftieth-normal hydrochloric acid, or 0.1 cc. of fiftieth-normal sulfuric acid, respectively.

Inorganic salts—1 Gm. of Calcium Iodobehenate dissolves in 10 cc. of warm chloroform with not more than an opalescence.

Magnesium and alkali salts—To 1 Gm. of Calcium Iodobehenate add 10 cc. of diluted hydrochloric acid and 40 cc. of water, and boil gently: a layer of fatty acid, which is soluble in ether and in chloroform, separates on the surface. Separate the water layer, make it slightly alkaline with ammonia T.S., and add an excess of ammonium oxalate T.S. (about 5 cc.): a white precipitate of calcium oxalate appears in the liquid. Allow to stand for 4 hours, filter, add 0.5 cc. of sulfuric acid to the filtrate, evaporate to dryness, and ignite: the weight of the residue does not exceed 3 mg.

Assay for iodine—Mix about 500 mg. of Calcium Iodobehenate, accurately weighed, with about 3 Gm. of anhydrous potassium carbonate. Place the mixture in a platinum crucible, cover it with about 1 Gm. more of anhydrous potassium carbonate, and heat it moderately, gradually increasing the temperature, but not making the mass brighter than dull red, until the mixture is completely carbonized. Extract the residue with boiling water, and wash it on a filter with boiling water until the last washing, acidified with nitric acid, produces no opalescence with silver nitrate T.S. Allow the filtrate and washings, measuring about 150 cc., to cool, add 2 drops of sodium bisulfite solution (1 in 5) and add dilute nitric acid (1 in 2) in small portions until effervescence ceases, then add 2 cc. in excess. Now add, dropwise, a dilute solution of potassium permanganate, prepared by mixing 1 cc. of 1 in 15 solution with 49 cc. of water, until a faint yellow color appears. Add 0.5 cc. of starch T.S., and titrate with tenth-normal silver nitrate until the blue color is just discharged, leaving a canary yellow precipitate. Each cc. of tenth-normal silver nitrate is equivalent to 12.69 mg. of I. Make the necessary correction for loss on drying as determined under *Loss on drying*.

Storage—Preserve Calcium Iodobehenate in well-closed, light-resistant containers.

AVERAGE DOSE—**0.5 Gm.** (approximately 7½ grains).

Calcium Lactate

CALCIUM LACTATE

Calcii Lactas

Calc Lact.

$Ca(C_3H_5O_3)_2 \cdot 5H_2O$ Mol. wt. 308.30

Calcium Lactate, when dried to constant weight at 120°, contains not less than 98 per cent of $Ca(C_3H_5O_3)_2$.

Description—Calcium Lactate is a white, almost odorless powder. It is somewhat efflorescent and at 120° becomes anhydrous.

Solubility—One Gm. of Calcium Lactate dissolves in 20 cc. of water. It is practically insoluble in alcohol.

Identification—A solution of Calcium Lactate (1 in 20) responds to the tests for *Calcium*, page 659, and for *Lactate*, page 661.

Loss on drying—Calcium Lactate loses not less than 25 per cent and not more than 30 per cent of its weight when dried to constant weight at 120°.

Free acid—A solution of 1 Gm. of Calcium Lactate in 20 cc. of water requires not more than 0.5 cc. of tenth-normal sodium hydroxide for neutralization, using phenolphthalein T.S. as the indicator.

Heavy metals—Dissolve 1 Gm. of Calcium Lactate in 2.5 cc. of diluted hydrochloric

acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Calcium Lactate is 20 parts per million.

Magnesium and alkali salts—*Dissolve 1 Gm. of Calcium Lactate in about 40 cc. of water, and add 500 mg. of ammonium chloride. Heat the solution to boiling, and* add ammonium oxalate T.S. to precipitate the calcium completely. Heat on a water bath for 1 hour, cool, dilute to 100 cc. with water, mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight. The weight of the residue does not exceed 5 mg.

Volatile fatty acid—Stir about 500 mg. of Calcium Lactate with 1 cc. of sulfuric acid, and warm: the mixture does not emit an odor of volatile fatty acid.

Assay—Weigh accurately about 500 mg. of the dried Calcium Lactate obtained in the test for *Loss on drying*, and dissolve it in 100 cc. of water and 2 cc. of hydrochloric acid. Heat to boiling, make alkaline with ammonia T.S., and add, with stirring, an excess of hot ammonium oxalate T.S. Heat on a water bath for 1 hour, filter through hardened filter paper, and wash thoroughly with small portions of water until the washings give no turbidity within 1 minute upon the addition of calcium chloride T.S. Puncture the filter paper, wash the precipitate into a beaker by means of a stream of hot water, followed by 30 cc. of dilute sulfuric acid (1 in 3). Heat the solution to 80°, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 10.91 mg. of $Ca(C_3H_5O_3)_2$.

Packaging and storage—Preserve Calcium Lactate in tight containers.

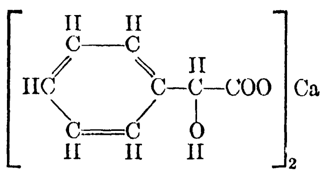
AVERAGE DOSE—**5 Gm.** (approximately 75 grains).

Calcium Mandelate

CALCIUM MANDELATE

Calcii Mandelas

Calc. Mandel.



$Ca(C_8H_7O_3)_2$ Mol. wt. 342.35

Calcium Mandelate, when dried at 100° for 4 hours, contains not less than 98.5 per cent of $Ca(C_8H_7O_3)_2$.

Description—Calcium Mandelate occurs as a white, odorless powder.

Solubility—Calcium Mandelate is slightly soluble in cold water and insoluble in alcohol. One Gm. dissolves in about 80 cc. of boiling water.

Identification—

A: Dissolve 2.00 Gm. of Calcium Mandelate in about 160 cc. of boiling water, then add, in small portions and with stirring, a solution of 820 mg. of reagent oxalic acid dissolved in 10 cc. of warm water. Evaporate the mixture to about 75 cc. and filter. Evaporate the filtrate to about 5 cc., refilter while hot, if necessary, and place the filtrate in a refrigerator for 2 hours. Filter the crystals of mandelic acid with suction, wash with two 1-cc. portions of ice-cold water, and dry at about 80°. The mandelic acid so obtained melts between 118° and 120°, page 667.

B: Dissolve about 100 mg. of the mandelic acid obtained in *Identification test A* in 2 cc. of water, and add 3 cc. of potassium dichromate T.S. and 5 cc. of sulfuric acid: the odor of benzaldehyde becomes apparent.

C: A solution of Calcium Mandelate, in just sufficient hydrochloric acid, responds to the tests for *Calcium*, page 659.

Loss on drying—When dried at 100° for 4 hours, Calcium Mandelate loses not more than 1 per cent of its weight.

Completeness and clarity of solution—One Gm. of Calcium Mandelate dissolves completely in 100 cc. of boiling water and the resulting solution is colorless.

Free Acid—A solution of 1 Gm. of Calcium Mandelate in 100 cc. of boiling water requires not more than 0.5 cc. of tenth-normal sodium hydroxide for neutralization, using phenolphthalein T.S. as indicator.

Chloride—A solution of 1 Gm. of Calcium Mandelate in a mixture of 40 cc. of water and 3 cc. of nitric acid shows no more *Chloride* than corresponds to 0.3 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—Mix 1 Gm. of Calcium Mandelate with 40 cc. of water, heat the mixture, and add hydrochloric acid, drop by drop, until the Calcium Mandelate has dissolved, then add 3 drops more of the acid. This solution shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Heat 1 Gm. of Calcium Mandelate with 15 cc. of water, and add diluted hydrochloric acid, drop by drop, until dissolved. Cool the solution, add 1 drop of phenolphthalein T.S., then add ammonia T.S. until a slight pink color is produced. Add 1 cc. of normal hydrochloric acid and dilute to 25 cc. with water, cool well, filter, and use the filtrate for the test: the heavy metals limit, page 657, for Calcium Mandelate is 30 parts per million.

Magnesium and alkali salts—Heat 1 Gm. of Calcium Mandelate with 50 cc. of water, and add hydrochloric acid until dissolved, then add 3 cc. more of the acid. Make the solution alkaline with ammonia T.S., heat to boiling, and completely precipitate the calcium by the addition of a moderate excess of ammonium oxalate T.S. (about 20 cc.). Heat the mixture on a water bath for 1 hour, cool, dilute with water to 100 cc., mix well, and filter. To 50 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight. The weight of the residue so obtained does not exceed 10 mg.

Assay—Weigh accurately about 500 mg. of Calcium Mandelate, previously dried at 100° for 4 hours, and dissolve it in 75 cc. of hot water by the addition of 3 cc. of hydrochloric acid, and proceed as directed in the *Assay* for *Calcium Lactate*, page 99, beginning with "Heat to boiling." Each cc. of tenth-normal potassium permanganate is equivalent to 17.12 mg. of $Ca(C_8H_7O_3)_2$.

Packaging and storage—Preserve Calcium Mandelate in well-closed containers.

AVERAGE DOSE—4 **Gm.** (approximately 60 grains).

Calcium Phosphate, Dibasic

DIBASIC CALCIUM PHOSPHATE

Calcii Phosphas Dibasicus

Calc. Phos. Dibas.—Dicalcium Orthophosphate

$CaHPO_4.2H_2O$ Mol. wt. 172.10

Dibasic Calcium Phosphate contains an amount of calcium equivalent to not less than 98 per cent of $CaHPO_4.2H_2O$.

Description—Dibasic Calcium Phosphate occurs as a white, odorless, and tasteless powder. It is stable in air.

Solubility—*Dibasic Calcium Phosphate is almost insoluble in water, but is readily soluble in diluted hydrochloric and nitric acids. It is insoluble in alcohol.*

Identification—

A: Dissolve about 100 mg. of Dibasic Calcium Phosphate by warming with a mixture of 5 cc. of diluted hydrochloric acid and 5 cc. of water, and add 5 cc. of ammonium oxalate T.S.: a white precipitate forms.

B: The addition of ammonium molybdate T.S. to a warm solution of Dibasic Calcium Phosphate in a slight excess of nitric acid produces a yellow precipitate of ammonium phosphomolybdate.

Loss on ignition—Weigh accurately about 1 Gm. of Dibasic Calcium Phosphate and ignite to constant weight: it loses not less than 24.5 per cent and not more than 26.5 per cent of its weight.

Insoluble in hydrochloric acid—Heat 5 Gm. of Dibasic Calcium Phosphate with a mixture of 40 cc. of water and 10 cc. of hydrochloric acid until no more dissolves, and dilute with water to 100 cc. If an insoluble residue remains, filter, wash with hot water until the washings cease to give a reaction for chloride, and dry the residue for 3 hours at 100°: the weight of the residue does not exceed 5 mg.

Carbonate—Mix 1 Gm. of Dibasic Calcium Phosphate with 5 cc. of water and add 2 cc. of hydrochloric acid: no effervescence occurs.

Chloride—To 300 mg. of Dibasic Calcium Phosphate add 10 cc. of water and 2 cc. of nitric acid and warm gently, if necessary, until no more dissolves. Dilute with water to 25 cc., filter if necessary, and add 1 cc. of silver nitrate T.S.: the turbidity is not greater than that produced by 1 cc. of fiftieth-normal hydrochloric acid, page 709.

Fluorine—Place 2 Gm. of Dibasic Calcium Phosphate, 5 cc. of perchloric acid, 15 cc. of water, and a few glass beads in a 50-cc. distilling flask connected with a condenser and carrying a thermometer and a capillary tube, both of which must extend into the liquid. Connect a small dropping funnel, filled with water, to the capillary tube. Support the flask on an asbestos mat with a hole which exposes about one-third of the flask to the flame. Distil until the temperature reaches 135°, receiving the distillate under the surface of a few cc. of water; then maintain at from 135° to 140° by adding water from the funnel. Continue the distillation until 70 cc. has been collected, dilute the distillate to 80 cc., and mix well. Place 40 cc. of the solution in a 50-cc. Nessler tube. In another similar Nessler tube place 40 cc. of water as a control. Add to each tube 0.1 cc. of sodium alizarinsulfonate T.S., and mix well. Add, drop by drop, and with stirring, twentieth-normal sodium hydroxide to the tube containing the distillate until its color just matches that of the control, which is faintly pink. Then add to each tube exactly 1 cc. of tenth-normal hydrochloric acid, and mix well. From a burette, graduated in 0.05 cc., add slowly to the tube containing the distillate enough reagent thorium nitrate solution, made by dissolving 250 mg. of thorium nitrate in 1000 cc. of water, so that, after mixing, the color of the liquid just changes to a faint pink. Note the volume of thorium nitrate solution added, add exactly the same volume to the control, and mix. Now add to the control sodium fluoride T.S. from a burette to make the colors of the two tubes match after dilution to the same volume. Mix well, and allow all air bubbles to escape before making the final color comparison. Check the end-point by adding 1 or 2 drops of sodium fluoride T.S. to the control: a distinct change in color should take place. Not more than 5 cc. of the sodium fluoride T.S. is required. Each cc. of sodium fluoride T.S. is equivalent to 10 micrograms of fluorine (F).

Sulfate—Dissolve 1 Gm. of Dibasic Calcium Phosphate in the smallest possible amount of diluted hydrochloric acid, dilute with water to exactly 100 cc., and filter if necessary. To 20 cc. of the filtrate add 1 cc. of barium chloride T.S.: the turbidity is not greater than that produced by 1 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic—A 5-cc. portion of a solution of Dibasic Calcium Phosphate (1 in 25) in diluted hydrochloric acid, [illegible] the preliminary treatment with sulfurous and sulfuric acids, meets the requirements of the test for *Arsenic*, page 618.

Barium—Heat 500 mg. of Dibasic Calcium Phosphate with 10 cc. of water, and add hydrochloric acid, dropwise, stirring after each addition, until no more dissolves. Filter, and add to the filtrate 2 cc. of potassium sulfate T.S.: no turbidity appears within 10 minutes.

Heavy metals—Warm 1 Gm. of Dibasic Calcium Phosphate with 3 cc. of diluted hydrochloric acid until no more dissolves, dilute with water to 50 cc., and filter: the heavy metals limit, page 657, for Dibasic Calcium Phosphate, determined in 25 cc. of the filtrate, is 30 parts per million.

Assay—Dissolve about 300 mg. of Dibasic Calcium Phosphate, accurately weighed, in 10 cc. of diluted hydrochloric acid. Dilute with water to about 150 cc. and add 15 cc. of ammonium oxalate T.S. Heat to boiling and slowly add, with stirring, ammonia T.S. to distinct alkaline reaction. Heat on a steam bath for 1 hour then filter through hardened filter paper, and wash with small quantities of hot water until the washings give no turbidity within 1 minute upon the addition of calcium chloride T.S. Puncture the filter paper, wash the precipitate into a beaker with hot water, add 30 cc. of dilute sulfuric acid (1 in 3), heat the solution to 80° and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 8.605 mg. of $CaHPO_4.2H_2O$.

NOTE—A Gooch crucible with a suitable pad may be used for filtering; place the crucible with the washed precipitate in a beaker, add the sulfuric acid and sufficient water to cover the crucible, heat to 80°, and titrate.

Packaging and storage—Preserve Dibasic Calcium Phosphate in well-closed containers.

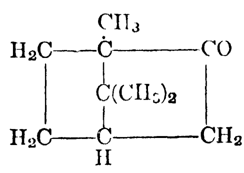
AVERAGE DOSE—1 **Gm.** (approximately 15 grains).

Camphor

CAMPHOR

Camphora

Camph.



$C_{10}H_{16}O$ Mol. wt. 152.23

Camphor is a ketone obtained from *Cinnamomum Camphora* (Linné) Nees et Ebermaier (Fam. *Lauraceæ*) (Natural Camphor) or produced synthetically (Synthetic Camphor).

Description—Camphor occurs as colorless or white crystals, granules, or crystalline masses; or as colorless to white, translucent, tough masses. It has a penetrating, characteristic odor, a pungent, aromatic taste, and is readily pulverizable in the presence of a little alcohol, ether, or chloroform. Its specific gravity is about 0.99. It slowly volatilizes at ordinary temperatures.

Solubility—One Gm. of Camphor dissolves in about 800 cc. of water, in 1 cc. of alcohol, in about 0.5 cc. of chloroform, and in 1 cc. of ether. It is freely soluble in carbon disulfide, in petroleum benzin, and in fixed and volatile oils.

Melting range—Camphor melts between 174° and 179° when tested as directed under Class 1, page 667, using a capillary glass tube having an internal diameter between 2 and 2.5 mm.
Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Natural Camphor, determined in a solution containing 10 Gm. of Camphor in sufficient alcohol to make 100 cc. and using a 200-mm. tube, is between +41° and +43°, page 675.
Moisture—A solution of Camphor in petroleum benzin (1 in 10) is clear.
Non-volatile matter—Gradually heat 2.0 Gm. of Camphor: it sublimes without carbonization and without leaving more than 0.05 per cent of non-volatile matter.
Halogens—Mix 100 mg. of finely divided Camphor with 200 mg. of sodium peroxide in a clean, dry, hard glass test tube of about 25 mm. internal diameter and 20 cm. length. Suspend the tube at an angle of about 45° by means of a clamp placed at the upper end, and gently heat the tube, starting at the upper end and gradually bringing the heat toward the lower part of the tube until incineration is complete. Dissolve the residue in 25 cc. of warm water, acidify with nitric acid, and filter the solution into a comparison tube. Wash the test tube and filter with two portions of 10 cc. each of hot water, adding the washings to the filtered solution. Add to the filtrate 0.5 cc. of tenth-normal silver nitrate, dilute with water to 50 cc., and mix thoroughly. The turbidity is not greater than that produced in a control test with the same quantities of the same reagents and 0.05 cc. of fiftieth-normal hydrochloric acid.
Packaging and storage—Preserve Camphor in tight containers, and avoid exposure to excessive heat.

AVERAGE DOSE—Oral or intramuscular, **0.2 Gm.** (approximately 3 grains).

Camphor and Soap Liniment

CAMPHOR AND SOAP LINIMENT

Linimentum Camphoræ et Saponis

Lin. Camph. et Sapon.—Soap Liniment

HARD SOAP, dried and granulated, or powdered	60 Gm.
CAMPHOR, in small pieces	45 Gm.
ROSEMARY OIL	10 cc.
ALCOHOL	700 cc.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Dissolve the camphor and the rosemary oil in the alcohol, add the soap, and then sufficient distilled water to make the product measure 1000 cc. Agitate the mixture until the soap is dissolved, set it aside in a cool place for 24 hours, and filter.

Alcohol content—From 62 to 66 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Camphor and Soap Liniment in well-closed containers.

CAMPHOR LINIMENT

Linimentum Camphoræ

Lin. Camph.—Camphorated Oil

Camphor Liniment contains not less than 19 per cent and not more than 21 per cent of camphor.

Caution—This preparation is not intended for hypodermic use.

CAMPHOR, in coarse powder..........................	200 Gm.
COTTONSEED OIL..	800 Gm.
To make.............................	1000 Gm.

Pour the cottonseed oil into a suitable dry flask or bottle, heat it on a water bath, add the camphor, and stopper the container securely. Dissolve the camphor by agitation without the further application of heat.

Assay—Place approximately 5 cc. of Camphor Liniment in a dried and tared 120-cc. Erlenmeyer flask, and weigh accurately. Connect the flask with a U-shaped drying tube, place the flask and tube in an air oven maintained at 110°, and pass a steady stream of carbon dioxide through the U-tube into the flask for 2 hours. The orifice of the gas delivery tube should be about 15 mm. above the surface of the Liniment. Remove the flask from the oven, blow out the remaining carbon dioxide with dry air, cool the flask in a desiccator, and weigh. The loss in weight is not less than 19 per cent and not more than 21 per cent of the weight of Camphor Liniment taken for the assay.

Packaging and storage—Preserve Camphor Liniment in tight containers.

CAMPHOR WATER

Aqua Camphoræ

Aq. Camph.

Camphor Water is a saturated solution of camphor in distilled water, prepared by solution of the camphor as described under *Waters*, page 726.

Camphorated Opium Tincture................................ page 362

Capsules

Caraway

CARAWAY

Carum

Caraway Fruit, Caraway Seed

Caraway is the dried ripe fruit of *Carum Carvi* Linné (Fam. *Umbelliferæ*)

Description—

Unground Caraway—Usually in separated mericarps; curved, tapering toward both ends; up to about 7 mm. in length and 2 mm. in diameter, externally dark brown to weak brown with 5 lighter colored, filiform, primary ribs between each pair of which, on the dorsal surface, occurs a secondary rib; odor and taste aromatic.

Histology—Mericarps nearly equilaterally pentangular with a fibrovascular bundle in each primary rib; epicarp of tangentially elongated epidermal cells with thick outer walls possessing a striated cuticle; mesocarp of collapsed, thin-walled parenchyma normally bearing 4 dorsal vittæ and 2 commissural vittæ, sometimes one or more additional, and located between the primary rib regions; endocarp of broad, slightly undulate, inner epidermal cross cells which are coherent with the collapsed cells of the spermoderm; endosperm of thick-walled, reserve parenchyma containing fixed oil and aleurone grains up to 10 microns in diameter, the latter with embedded rosette aggregates of calcium oxalate up to 4 microns in diameter; an embryo embedded in the upper end of the endosperm.

Powdered Caraway—Moderate yellowish brown to light olive brown; fragments of the epicarp with striped cuticle; numerous polyhedral endosperm cells containing aleurone grains with embedded rosette aggregate crystals of calcium oxalate; few fragments of slightly lignified fibers and spiral tracheæ; fragments of cross cells of endocarp; orange to yellow fragments of vittæ; no reticulate parenchyma.

Foreign organic matter—The amount of other fruits, seeds, or other foreign organic matter in Caraway does not exceed 3 per cent, pages 710 and 711.
Acid-insoluble ash—Caraway yields not more than 1.5 per cent of *Acid-insoluble ash*, pages 710 and 711.
Packaging and storage—Preserve Caraway in well-closed containers. Caraway is susceptible to attack by insects, page 9.

Carbachol

CARBACHOL

Carbacholum

Carbachol.—Carbamylcholine Chloride

$NH_2CO.O.CH_2CH_2.N(CH_3)_3.Cl$

$C_6H_{15}ClN_2O_2$ Mol. wt. 182.65

Description—Carbachol occurs as white or faintly yellow crystals or as a crystalline powder. It is odorless and hygroscopic. Its solutions are neutral to litmus paper.
Solubility—One Gm. of Carbachol dissolves in about 1 cc. of water and in 50 cc. of alcohol. It is almost insoluble in chloroform and in ether.
Melting range—Carbachol melts between 200° and 203°, page 667.
Identification—
A: To a solution of about 5 mg. of Carbachol in 5 cc. of water, add 5 cc. of a solution of ammonium reineckate (1:30) and shake vigorously for 1 minute: a red precipitate is formed which is soluble in acetone.
B: To 500 mg. of Carbachol add 10 cc. of alcoholic potassium hydroxide T.S. and boil gently for 1 to 2 minutes: a white precipitate forms, and when cool an amine odor is perceptible. Decant the supernatant liquid and add to the precipitate 3 cc. of diluted hydrochloric acid: effervescence is produced.
C: A solution of Carbachol (1 in 20) responds to the tests for *Chloride*, page 659.
D: To a solution of 100 mg. of Carbachol in 1 cc. of water add 3 cc. of a solution of gold chloride (1 in 10): a precipitate of yellow crystals of the aurichloride is produced. The precipitate, upon recrystallization from about 5 cc. of hot water, separates in glistening scale-like crystals which, after drying at 100°, melt between 183° and 185°, page 667.
Loss on drying—Dry about 1 Gm. of Carbachol, accurately weighed, over sulfuric acid for 18 hours: the loss in weight is not more than 0.5 per cent.
Residue on ignition—Carbachol yields not more than 0.1 per cent of residue on ignition, page 685.
Heavy metals—Add 2 cc. of diluted acetic acid to 1.0 Gm. of Carbachol, and sufficient water to make 25 cc.: the heavy metals limit, page 657, for Carbachol, is 30 parts per million.
Nitrogen content—Weigh accurately about 200 mg. of Carbachol, previously dried over sulfuric acid for 18 hours, transfer it to a Kjeldahl flask, and determine the nitrogen as described on page 761, using 40 cc. of tenth-normal hydrochloric or sulfuric acid to absorb the ammonia, and tenth-normal sodium hydroxide to titrate the excess of acid. Each cc. of tenth-normal acid is equivalent to 1.401 mg. of nitrogen. The nitrogen found corresponds to not less than 15.0 per cent and not more than 15.5 per cent.
Packaging and storage—Preserve Carbachol in tight containers.

AVERAGE DOSE—Oral, 2 mg. (approximately 1/30 grain).
Subcutaneous, 0.25 mg. (approximately 1/250 grain).

Carbachol Injection

CARBACHOL INJECTION

Injectio Carbacholi

Inj. Carbachol.

Carbachol Injection is a sterile solution of carbachol in water for injection. It contains not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_6H_{15}ClN_2O_2$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Carbachol Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Evaporate a volume of the Injection, equivalent to about 2 mg. of carbachol, to about 1 cc., transfer to a centrifuge tube, add 0.2 cc. of a solution of gold chloride (1 in 10) and place the tube in a refrigerator for 2 hours. Centrifuge, decant the supernatant liquid as completely as possible, and wash the precipitate twice by adding a few drops of water, stirring with a wire, centrifuging, and decanting, then dry the precipitate at 100° for 2 hours: the aurichloride so obtained melts between 182° and 185°.

Assay—Transfer an accurately measured volume of the Injection equivalent to 8 mg. of carbachol, to a 125-cc. Erlenmeyer flask, dilute with water, if necessary, to about 20 cc., add 3 cc. of normal sodium hydroxide, and reflux for 20 minutes. Cool, add 2 drops of phenolphthalein T.S., follow with diluted acetic acid until the red color is just discharged, and then add 2 more drops of the acid. Add to the solution 5 cc. of freshly prepared ammonium reineckate T.S., shake vigorously, and allow to stand for 45 minutes at about 25°. Filter through a moderately coarse sintered glass crucible, using portions of the filtrate to transfer the precipitate completely to the filter. Wash the precipitate on the filter with four 5-cc. portions of ice-cold water, then with two 1-cc. portions of dehydrated alcohol, and dry for 1 hour over sulfuric acid. Completely dissolve the precipitate of the choline reineckate by pouring over it 1-cc. portions of acetone, without the application of suction, receiving the solution in a 10-cc. volumetric flask or cylinder. Add acetone to the 10-cc. mark, and mix well.

Determine the percentage of light transmission of the acetone solution in a suitable photoelectric colorimeter with a filter having a maximum transmission at about 520 millimicrons, taking the transmission of acetone as 100 per cent. From the percentage of transmission, calculate by means at the curve prepared with U. S. P. Choline Chloride Reference Standard as described in the next paragraph, the weight of choline chloride derived from the quantity of the sample taken, and multiply this weight by 1.308 to determine the quantity of $C_6H_{15}ClN_2O_2$ represented.

To prepare the transmission curve with choline chloride proceed as follows: Place about 100 mg. of U. S. P. Choline Chloride Reference Standard in a tared, dry, glass-stoppered weighing bottle, and dry at 110° for 2 hours. Close the weighing bottle immediately after opening the desiccator and weigh the dried Reference Standard. Transfer the entire contents of the weighing bottle with the aid of water to a 100-cc. volumetric flask, fill to the mark with water, and mix well. Accurately measure 2-, 4-, 6-, 8-, and 10-cc. aliquots of this solution into 125-cc. Erlenmeyer flasks, dilute with water to 20 cc. and proceed as directed for the assay sample, beginning with "add 3 cc. of normal sodium hydroxide." From the data thus obtained prepare the reference curve by plotting the percentage transmission of the several aliquots on the ordinate scale against the corresponding quantities of choline chloride on the abscissa scale.

Packaging and storage—Preserve Carbachol Injection in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Sizes—Carbachol Injection usually available contains the following amount of carbachol: 0.25 mg. ($\frac{1}{250}$ grain) in 1 cc.

AVERAGE DOSE OF CARBACHOL—Subcutaneous, **0.25 mg.** (approximately $\frac{1}{250}$ grain)

Carbachol Tablets

CARBACHOL TABLETS

Tabellæ Carbacholi

Tab. Carbachol.

Carbachol Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_6H_{15}ClN_2O_2$.

Identification—Triturate a number of the Tablets, equivalent to about 20 mg. of carbachol, with 25 cc. of methanol, filter, and wash with 25 cc. of the methanol. Evaporate the filtrate to dryness on a steam bath, dissolve the residue in 10 cc. of cold water, and filter. Transfer the filtrate to a centrifuge tube, add 1 cc. of a solution of gold chloride (1 in 10), and place the tube in a refrigerator for 30 minutes. Centrifuge, decant the supernatant liquid as completely as possible, and wash the precipitate twice by adding 1 cc. of water, stirring with a wire, centrifuging, and decanting; then dry it at 100° for 1 hour. The aurichloride so obtained melts between 182° and 185°.

Assay—Dissolve a counted number of not less than 20 Carbachol Tablets in sufficient water to make 100 cc. Filter through a small dry filter into a dry flask, rejecting the first 10 cc. of the filtrate. Transfer an accurately measured aliquot of the filtrate, equivalent to 8 mg. of carbachol, to a 125-cc. Erlenmeyer flask. Add 6 cc. of normal sodium hydroxide and reflux for 20 minutes. Cool, add 2 drops of phenolphthalein T.S., and follow with diluted acetic acid until the red color is just discharged, and then add 2 more drops of the acid. Proceed as directed in the *Assay* under *Carbachol Injection*, page 108, beginning with "Add to the solution 5 cc. of freshly prepared ammonium reineckate T.S."

Packaging and storage—Preserve Carbachol Tablets in tight containers.

Sizes—Carbachol Tablets usually available contain the following amount of carbachol: 2 mg. ($\frac{1}{30}$ grain).

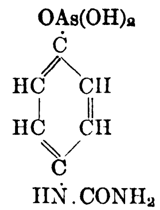
AVERAGE DOSE OF CARBACHOL—2 mg. (approximately $\frac{1}{30}$ grain).

Carbarsone

CARBARSONE

Carbarsonum

Carbarson.



$C_7H_9AsN_2O_4$ Mol. wt. 260.07

Carbarsone, when dried at 80° for 6 hours, contains not less than 28.1 per cent and not more than 28.8 per cent of arsenic (As).

Description—Carbarsone occurs as a white, almost odorless powder, having a slightly acid taste. Its saturated solution is acid to litmus.

Solubility—Carbarsone is slightly soluble in water and in alcohol, and is nearly insoluble in chloroform and in ether. It is soluble in solutions of alkali hydroxides and carbonates.

Identification—

A: Place about 400 mg. of Carbarsone in a test tube, add 5 cc. of sodium hydroxide solution (1 in 5), and heat gently: a piece of moistened red litmus paper held over the mouth of the tube turns blue.

B: Place about 1 Gm. of Carbarsone in a test tube, and dissolve it in 10 cc. of sodium hydroxide T.S. and 10 cc. of water, add 2 Gm. of sodium hydrosulfite, and warm the mixture to 50°: a light yellow precipitate is formed, which is insoluble in an excess of sodium hydroxide T.S.

C: To a portion of the solution resulting from the *Assay* add hydrogen sulfide T.S.: a yellow precipitate of arsenic sulfide is produced, which is soluble in ammonium carbonate T.S.

Loss on drying—When dried at 80° for 6 hours, Carbarsone loses not more than 1.5 per cent of its weight.

Arsenate—Dissolve 500 mg. of Carbarsone in 2 cc. of ammonia T.S., dilute to 5 cc. with water, add 3 cc. of magnesia mixture T.S., and shake vigorously: no precipitate forms within 30 minutes.

Assay—Weigh accurately about 200 mg. of Carbarsone, previously dried at 80° for 6 hours and determine the arsenic content as directed in the *Assay* for *Arsphenamine*, page 51. Each cc. of tenth-normal sodium thiosulfate is equivalent to 3.746 mg. of As.

Packaging and storage—Preserve Carbarsone in well-closed containers.

AVERAGE DOSE—0.2 Gm. (approximately 3 grains).

CARBON DIOXIDE

Carbonei Dioxidum

Carbon. Dioxid.—Carbonic Acid Gas

CO_2 Mol. wt. 44.01

Carbon Dioxide contains not less than 99 per cent by volume of CO_2.

Description—Carbon Dioxide is an odorless, colorless gas. A solution of the gas has a faintly acid taste. A liter of Carbon Dioxide at a pressure of 760 mm. and at 0° weighs 1.977 Gm.

Solubility—One volume of Carbon Dioxide dissolves in about 1 volume of water.

Identification—

A: Carbon Dioxide extinguishes a flame.

B: Carbon Dioxide produces a white precipitate when passed into barium hydroxide T.S., the precipitate dissolving in acetic acid with effervescence.

Note—Cylinders containing Carbon Dioxide must be kept at a temperature of 25°, ±2°, for at least 6 hours before the Carbon Dioxide is withdrawn for the following determinations. Samples for the following tests and assay are to be corrected to a pressure of 760 mm. and a temperature of 25°.

Acid and sulfur dioxide—Pass 1000 cc. of Carbon Dioxide through 50 cc. of recently boiled water which has been cooled to room temperature. Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of the gas. The delivery tube must have an orifice approximately 1 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the water. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with 50 cc. of water. After the passage of the gas, pour the liquid into one of two similar comparator tubes "A" and add 0.1 cc. of methyl orange T.S. To the other tube "B" containing 50 cc. of cooled, recently boiled water, add 1 cc. of hundredth-normal hydrochloric acid, and then 0.1 cc. of methyl orange T.S. Viewed downward over a white surface, the liquid in tube "A" shows no deeper shade of red than that in tube "B."

Phosphine, hydrogen sulfide, and organic reducing substances—Pass 1000 cc. of Carbon Dioxide, under conditions comparable to those in the test for *Acid and sulfur dioxide*, through a mixture of 25 cc. of silver ammonium nitrate T.S. and 3 cc. of ammonia T.S.: no turbidity or darkening is produced, as shown by comparing it with another portion of the test solution through which the gas has not been passed.

Carbon monoxide—Collect 1000 cc. of the Carbon Dioxide to be tested, and, for the blank test, 1000 cc. of carbon dioxide prepared by treating sodium bicarbonate with hydrochloric acid in suitable flasks. Add 10 cc. of water to 0.5 cc. of blood, page 748, and mix thoroughly. Immediately add 2.5 cc. of the blood dilution to each flask, stopper, and shake the flasks frequently during 15 minutes. To each flask add 40 mg. of a mixture of equal parts by weight of pyrogallol and tannic acid. Shake thoroughly, and allow the flasks to stand in the dark for 15 minutes. Pour the contents of each flask into test tubes for observation. The solution from the Carbon Dioxide being tested shows no pink coloration and matches the gray color produced in the blank test.

Assay—Place a sufficient quantity of mercury in a 100-cc. gas burette or nitrometer, provided with a two-way stopcock and a two-way outlet, and properly connected with a balancing tube. Connect one of the outlet tubes of the nitrometer with a gas pipette of suitable capacity. Place in the pipette about 125 cc. of 50 per cent potassium hydroxide solution. Draw the liquid (free from air bubbles) through the capillary opening, connection, and stopcock opening in the nitrometer by reducing the pressure in the nitrometer tube and opening the stopcock controlling the connection with the gas pipette. Then close the stopcock. Having completely filled the nitrometer, the other stopcock opening, and the other intake tube

with mercury, draw into the nitrometer exactly 100 cc. of Carbon Dioxide by reducing the pressure in the tube. Close this stopcock. Increase the pressure on the Carbon Dioxide in the nitrometer tube, and open the stopcock controlling the connection with the gas pipette. Force the entire volume of gas into the pipette. Close the stopcock, and rock the pipette gently, providing frequent contact of the liquid and the gas. At the end of 5 minutes most of the gas will have been absorbed by the liquid. At this time, to facilitate the absorption of the last portion of the Carbon Dioxide, draw some of the liquid into the nitrometer tube, and force the residual gas back upon the surface of the liquid in the gas pipette. Again rock the pipette until no further diminution in the volume of gas occurs. Draw the residual gas, if any, into the nitrometer tube, and measure its volume. Not more than 1 cc. of gas remains.

Packaging and storage—Preserve Carbon Dioxide in tight containers.

Cardamom Seed

CARDAMOM SEED

Cardamomi Semen

Cardam. Sem.

Cardamom Seed is the dried ripe seed of *Elettaria Cardamomum* Maton (Fam. *Zingiberaceæ*).

Cardamom Seed should be recently removed from the capsules.

Description—

Unground Cardamom Seed—Mostly agglutinated into groups of 2 to 7 by the adhering membranous aril, the individual seeds oblong-ovoid or irregularly 3- to 4-sided, from 3 to 4 mm. in length; convex on the dorsal side, strongly longitudinally grooved on the ventral side and coarsely tuberculated; externally pale orange to dark brown; odor aromatic; taste aromatic, pungent and slightly bitter.

Histology—A loosely attached membranous aril; seed-coat consisting of an epidermal layer of thick-walled cells, a pigment layer of small cells with red to orange contents, a layer of volatile oil cells with suberized walls and a single layer of radially elongated strongly lignified stone cells with inner walls heavily thickened, and a minute lumen containing silica. Perisperm large, colorless, surrounding a central, orange to yellow endosperm enclosing a small straight embryo.

Powdered Cardamom Seed—Pale brown to weak yellow to light olive green; endosperm and perisperm cells filled with starch grains from 1 to 4 microns in diameter or containing one or more prisms of calcium oxalate from 10 to 25 microns in diameter; fragments of seed-coat with red to orange colored cells, polygonal in surface view and about 20 microns in diameter; fragments of pericarp tissue with spiral tracheæ and with accompanying slightly lignified fibers, relatively few.

Acid-insoluble ash—Cardamom Seed yields not more than 4 per cent of *Acid-insoluble ash*, pages 710 and 711.

Packaging and storage—Preserve Cardamom Seed against attack by insects, page 9.

COMPOUND CARDAMOM TINCTURE

Tinctura Cardamomi Composita

Tr. Cardam. Co.

CARDAMOM SEED, in moderately coarse powder........	20 Gm.
CINNAMON, in fine powder...........................	25 Gm.
CARAWAY, in moderately coarse powder..............	12 Gm.
COCHINEAL, in fine powder..........................	5 Gm.
To make..........................	1000 cc.

Prepare a tincture by Process M, page 708, macerating the mixed powders in 750 cc. of a mixture of 50 cc. of glycerin and 950 cc. of diluted alcohol, and completing the preparation by using first the remainder of the mixture prepared as directed above, and then diluted alcohol.

Packaging and storage—Preserve Compound Cardamom Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 43 to 47 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—4 cc. (approximately, 1 fluidrachm).

CASCARA SAGRADA

Cascara Sagrada

Casc. Sagr.—Rhamnus Purshiana

Cascara Sagrada is the dried bark of *Rhamnus Purshiana* De Candolle (Fam. *Rhamnaceæ*).

Cascara Sagrada should be collected at least one year before it is used in medicinal preparations.

Description—
Unground Cascara Sagrada—Usually in flattened or transversely curved pieces, occasionally in quills; bark from 1 to 5 mm. in thickness; outer surface brown, purplish brown or brownish red, longitudinally ridged, with grayish or whitish lichen patches, sometimes with numerous lenticels and occasionally with moss attached; inner surface longitudinally striate, light yellow, weak reddish brown or moderate yellowish brown; fracture short with projections of bast fiber bundles in the inner bark; odor distinct; taste bitter and slightly acrid.

Histology—Cork yellowish brown, purple or reddish brown, up to 10 or more rows of small cells; stone cells in yellowish, tangentially elongated groups of 20 to 50 cells; medullary rays 1 to 4 cells wide, 15 to 25 cells deep, frequently diagonal or curved, forming converging groups; bast fibers in small bundles, more or less surrounded by crystal fibers and located between the medullary rays; parenchyma with brown walls and containing starch grains or calcium oxalate.

Powdered Cascara Sagrada—Moderate yellowish brown to dusky yellowish orange; consisting of broken bast fiber bundles with the accompanying crystal fibers containing monoclinic prisms of calcium oxalate; stone cells more or less adhering, with thick, finely lamellated and porous walls; fragments of reddish brown to yellow cork; masses of parenchyma and medullary ray cells colored reddish brown to orange upon the addition of a solution of an alkali; starch grains spheroidal, up to 8 microns in diameter; calcium oxalate in monoclinic prisms or rosette aggregates from 6 to 20 microns in diameter, occasionally up to 45 microns in diameter.

Foreign organic matter—The amount of *Foreign organic matter* in Cascara Sagrada does not exceed 4 per cent, pages 710 and 711.

Identification—

A: Add 100 mg. of powdered Cascara Sagrada to 10 cc. of hot water, shake the mixture occasionally until it is cold, then filter it, dilute the filtrate with sufficient water to make it measure 10 cc., and add 10 cc. of ammonia T.S.: an orange color is produced in the mixture.

B: Cascara gives a red to reddish brown color when treated with ammonia T.S.

C: Macerate 100 mg. of powdered Cascara Sagrada with 10 drops of alcohol, add 10 cc. of water, boil the mixture, then cool and filter it, and shake the filtrate with 10 cc. of ether: a greenish yellow ether solution separates. Shake 3 cc. of this ether solution with 3 cc. of ammonia T.S., and dilute the separated ammonia solution with 20 cc. of water: the mixture retains a distinct orange pink color.

Cascara Sagrada Extract

CASCARA SAGRADA EXTRACT

Extractum Cascaræ Sagradæ

Ext. Casc. Sagr.—Powdered Cascara Sagrada Extract, Rhamnus Purshiana Extract

One Gm. of the Extract represents 3 Gm. of cascara sagrada.

Mix 900 Gm. of cascara sagrada, in coarse powder, with 4000 cc. of boiling water, and macerate the mixture during 3 hours. Then transfer it to a percolator, allow it to drain, and exhaust it by percolation, using boiling water as the menstruum and collecting about 5000 cc. of percolate. Evaporate the percolate to dryness, reduce the extract to a fine powder, and add sufficient starch, dried at 100°, to make the product weigh 300 Gm. Mix the powders thoroughly and pass the Extract through a fine sieve.

Packaging and storage—Preserve Cascara Sagrada Extract in tight, light-resistant containers, preferably at a temperature not above 30°.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Cascara Sagrada Extract Tablets

CASCARA SAGRADA EXTRACT TABLETS

Tabellæ Cascaræ Sagradæ Extracti

Tab. Casc. Sagr. Ext.—Cascara Tablets

Cascara Sagrada Extract Tablets are prepared from cascara **sagrada** extract.

Preservation and storage—Preserve Cascara Sagrada Extract Tablets in well-closed containers. If the Tablets are coated use tight containers.
Sizes—Cascara Sagrada Extract Tablets usually available contain the following amounts of cascara sagrada extract: 0.12, 0.2, and 0.3 Gm. (2, 3, and 5 grains).

AVERAGE DOSE OF CASCARA SAGRADA EXTRACT—**0.3 Gm.** (approximately 5 grains).

Cascara Sagrada Fluidextract

CASCARA SAGRADA FLUIDEXTRACT

Fluidextractum Cascaræ Sagradæ

Fldext. Casc. Sagr.—Rhamnus Purshiana Fluidextract

CASCARA SAGRADA, in very coarse powder............ 1000 Gm.

Prepare a fluidextract by Process D, page 654 Evaporate the percolate until it measures 800 cc., and when it is cold, gradually add 200 cc. of alcohol and, if necessary, sufficient water to make the product measure 1000 cc. Mix thoroughly.

Packaging and storage—Preserve Cascara Sagrada Fluidextract in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 17 to 19 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—**1 cc.** (approximately 15 minims).

Cascara Sagrada Fluidextract, Aromatic

AROMATIC CASCARA SAGRADA FLUIDEXTRACT

Fluidextractum Cascaræ Sagradæ Aromaticum

Fldext. Casc. Sagr. Arom.—Aromatic Rhamnus Purshiana Fluidextract

Cascara Sagrada, in very coarse powder.........	1000	Gm.
Magnesium Oxide..............................	120	Gm.
Pure Glycyrrhiza Extract.....................	40	Gm.
Saccharin....................................	2	Gm.
Anise Oil....................................	0.65	cc.
Coriander Oil................................	0.15	cc.
Methyl Salicylate............................	0.1	cc.
Alcohol......................................	200	cc.
Water, a sufficient quantity,		
To make......................	1000	cc.

Thoroughly mix the cascara sagrada with the magnesium oxide, moisten it uniformly with 2000 cc. of boiling water, and set it aside in a shallow container for 48 hours, stirring it occasionally. Pack it in a percolator, and percolate with boiling water until the drug is exhausted. Evaporate the percolate, at a temperature not exceeding 100°, to 750 cc., and at once dissolve in it the pure glycyrrhiza extract. When the liquid has cooled, add the alcohol, in which the saccharin, methyl salicylate, and oils have been dissolved, and finally sufficient water to make the Fluidextract measure 1000 cc. Mix thoroughly.

Packaging and storage—Preserve Aromatic Cascara Sagrada Fluidextract in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol content—From 17 to 19 per cent, by volume, of C_2H_5OH.

Average dose—**2 cc.** (approximately 30 minims).

Castor Oil

CASTOR OIL

Oleum Ricini

Ol. Ricin.

Castor Oil is the fixed oil obtained from the seed of *Ricinus communis* Linné (Fam. *Euphorbiaceæ*).

Description—Castor Oil is a pale yellowish or almost colorless, transparent, viscid liquid. It has a faint, mild odor, and a bland, afterwards slightly acrid and usually nauseating taste.
Solubility—Castor Oil is soluble in alcohol and is miscible with dehydrated alcohol and with glacial acetic acid, chloroform, and ether.
Specific gravity—The specific gravity of Castor Oil is not less than 0.945 and not more than 0.965.
Distinction from most other fixed oils—Castor Oil is only partly soluble in petroleum benzin (*most other fixed oils*), but it yields a clear liquid with an equal volume of alcohol (*foreign fixed oils*).
Free fatty acids—The free fatty acids in 10 Gm. of Castor Oil require for neutralization not more than 7.5 cc. of tenth-normal sodium hydroxide, pages 645 and 646.
Iodine value—The iodine value of Castor Oil is not less than 83 and not more than 88, pages 645 and 647.
Saponification value—The saponification value of Castor Oil is not less than 179 and not more than 185, pages 645 and 647.
Packaging and storage—Preserve Castor Oil in tight containers, and avoid exposure to excessive heat.

AVERAGE DOSE—**15 cc.** (approximately 4 fluidrachms).

Cedar Leaf Oil

CEDAR LEAF OIL

Oleum Cedri Folii

Ol. Ced. Fol.—Arbor Vitæ Oil, Thuja Oil

Cedar Leaf Oil is the volatile oil distilled with steam from the fresh leaves of *Thuja occidentalis* Linné (Fam. *Pinaceæ*). Cedar Leaf Oil contains not less than 60 per cent of ketones, calculated as thujone ($C_{10}H_{16}O$).

Description—Cedar Leaf Oil is a colorless or yellow liquid, having the characteristic odor of arbor vitæ.
Solubility—Cedar Leaf Oil is soluble in 3 volumes of 70 per cent alcohol.
Specific gravity—The specific gravity of Cedar Leaf Oil is not less than 0.910 and not more than 0.920.
Optical rotation—The optical rotation of Cedar Leaf Oil is not less than $-10°$ and not more than $-13°$ in a 100-mm. tube, page 675.
Refractive index—The refractive index of Cedar Leaf Oil is not less than 1.4560 and not more than 1.4590 at 20°, page 682.
Assay—Dissolve 5 Gm. of hydroxylamine hydrochloride in 9 cc. of warm water, add 80 cc. of 90 per cent alcohol and 2 cc. of bromophenol blue T.S. Neutralize the mixture with half-normal alcoholic potassium hydroxide, and add sufficient 90 per cent alcohol to make 100 cc. Weigh accurately about 1 Gm. of Cedar Leaf Oil, add 20 cc. of the hydroxylamine reagent, shake the mixture, and titrate it slowly, with frequent agitation, with half-normal alcoholic potassium hydroxide. Continue the titration for 4 hours, neutralizing at intervals of 30 minutes. Each cc. of half-normal alcoholic potassium hydroxide is equivalent to 76.12 mg. of ketones, calculated as thujone ($C_{10}H_{16}O$).
Packaging and storage—Preserve Cedar Leaf Oil in well-filled, tight containers and avoid exposure to excessive heat.

Chalk Mixture

CHALK MIXTURE

Mistura Cretæ

Mist. Cret.

PREPARED CHALK	60 Gm.
SACCHARIN SODIUM	0.3 Gm.
BENTONITE MAGMA	500 cc.
CINNAMON WATER	400 cc.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Mix the bentonite magma with the cinnamon water, and add 30 cc. of this mixture to the prepared chalk and the saccharin sodium in a mortar, intimately mixing to a smooth, uniform paste. Gradually incorporate the remainder of the diluted magma and finally enough distilled water to make 1000 cc.

AVERAGE DOSE—**15 cc.** (approximately 4 fluidrachms).

Chalk, Prepared

PREPARED CHALK

Creta Præparata

Cret. Præp.—Drop Chalk

Prepared Chalk is a native form of calcium carbonate freed from most of its impurities by elutriation, and containing, when dried at 200° for 4 hours, not less than 97 per cent of $CaCO_3$.

Description—Prepared Chalk is a white to grayish white, microcrystalline powder, often prepared in cones. It is odorless and tasteless, and is stable in air.

Solubility—Prepared Chalk is practically insoluble in water and is insoluble in alcohol. It dissolves with effervescence in diluted hydrochloric acid, and in diluted nitric acid.

Identification—Prepared Chalk responds to the *Identification* tests under *Precipitated Calcium Carbonate*, page 92.

Acid-insoluble residue—Mix 1 Gm. of Prepared Chalk with 50 cc. of water, add diluted hydrochloric acid, dropwise, with agitation until it ceases to cause effervescence. Collect the insoluble residue on a filter, wash it with water, ignite, and weigh: the weight of the residue does not exceed 20 mg.

Heavy metals—Mix 1 Gm. of Prepared Chalk with 5 cc. of water, add slowly 8 cc. of diluted hydrochloric acid, and evaporate the mixture to dryness on a water bath. Dissolve the residue in 20 cc. of water, and filter. Add water to the filtrate to make 23 cc. and then add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Prepared Chalk is 40 parts per million.

Assay—Proceed as directed under *Precipitated Calcium Carbonate*, page 92.
Packaging and storage—Preserve Prepared Chalk in well-closed containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

Charcoal, Activated

ACTIVATED CHARCOAL

Carbo Activatus

Carbo Activat.

Activated Charcoal is the residue from the destructive distillation of various organic materials, treated to increase its adsorptive power.

Note—When Carbo Ligni is prescribed, Activated Charcoal may be dispensed.

Description—Activated Charcoal is a fine, black, odorless, tasteless powder free from gritty matter.

Volatile substances—Dry Activated Charcoal to constant weight at 120°: the loss does not exceed 15 per cent.

Residue on ignition—Ignite about 500 mg. of Activated Charcoal, accurately weighed, to constant weight in a platinum crucible: the residue does not exceed 4 per cent.

Acid or alkali—Boil 3 Gm. of Activated Charcoal with 60 cc. of water for 5 minutes, allow to cool, dilute to the original volume with water, and filter: the filtrate is colorless and is neutral to litmus paper.

Chloride—A 10-cc. portion of the filtrate obtained in the test for *Free acid or alkali* shows no more *Chloride* than is equivalent to 1.5 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—Another 10-cc. portion of the filtrate obtained in the test for *Free acid or alkali* shows no more *Sulfate* than is equivalent to 1 cc. of fiftieth-normal sulfuric acid, page 70).

Sulfide—Boil 500 mg. of Activated Charcoal with a mixture of 20 cc. of water and 5 cc. of hydrochloric acid: lead acetate test paper is not blackened when held in the vapor of the boiling mixture.

Cyanogen compounds—Place a mixture of 5 Gm. of Activated Charcoal, 50 cc. of water, and 2 Gm. of tartaric acid in a distilling flask connected with a condenser provided with a tightly fitting adapter, the end of which dips under the surface of a mixture of 2 cc. of sodium hydroxide T.S. and 10 cc. of water, contained in a small flask surrounded by ice. Heat the mixture in the distilling flask to boiling, and distil about 25 cc. Dilute the distillate to 50 cc. with water, and mix thoroughly. To 25 cc. of the diluted distillate add about 50 mg. of ferrous sulfate dissolved in 1 cc. of water, heat the mixture almost to boiling, cool, and add 1 cc. of hydrochloric acid: no blue color is produced.

Acid-soluble substances—Boil 1 Gm. of Activated Charcoal with a mixture of 20 cc. of water and 5 cc. of hydrochloric acid for 5 minutes, filter into a tared porcelain crucible, and wash the residue with 10 cc. of hot water, adding the washings to the filtrate. Add 1 cc. of sulfuric acid to the filtrate, evaporate to dryness, and ignite the residue to constant weight: the weight of the residue does not exceed 35 mg.

Heavy metals—Boil 1 Gm. of Activated Charcoal with a mixture of 20 cc. of diluted hydrochloric acid and 5 cc. of bromine T.S. for 5 minutes, filter, and wash the charcoal and filter with 50 cc. of boiling water. Evaporate the filtrate and washings to dryness, and extract the residue with a mixture of 1 cc. of normal hydrochloric acid, 20 cc. of water, and 5 cc. of sulfurous acid T.S. Boil the solution until all of

the sulfur dioxide is expelled, then dilute it to a volume of 50 cc. with water. To 10 cc. of the solution add 10 cc. of hydrogen sulfide T.S.: the solution does not show a darker coloration in 10 seconds than that produced by the addition of 10 cc. of hydrogen sulfide T.S. to 9 cc of water, to which 1.0 cc. of standard lead solution, page 657, has been added.

Uncarbonized constituents—To 250 mg. of Activated Charcoal add 10 cc. of sodium hydroxide T.S., heat to boiling, and filter: the filtrate is colorless.

Adsorptive power—

A: Dissolve 100 mg. of strychnine sulfate in 50 cc. of water, add 1 Gm. of Activated Charcoal, shake the mixture vigorously for 5 minutes, filter immediately through a dry filter, and reject the first 20 cc. of filtrate. The addition of 1 drop of hydrochloric acid and 5 drops of mercuric potassium iodide T.S. to 10 cc. of the subsequent filtrate produces no turbidity.

B: Dissolve 250 mg. of methylene blue in enough water to make 250 cc. of solution. Measure exactly 50 cc. of this solution at 25° into each of two 100-cc. glass-stoppered flasks. Add to one flask exactly 250 mg. of Activated Charcoal, stopper the flask, and shake it vigorously for 5 minutes. Filter the contents of each flask through a dry filter, rejecting the first 20 cc. of each filtrate. Measure exactly 25 cc. of the remaining filtrate into each of two 250-cc. volumetric flasks. Add to each flask 50 cc. of a solution of sodium acetate (1 in 10), and mix thoroughly, then add from a burette 35 cc. of tenth-normal iodine, keeping the mixture in constant rotation. Stopper the flasks and allow them to stand for 50 minutes, shaking them vigorously at intervals of 10 minutes. Dilute each mixture to exactly 250 cc. with water, mix thoroughly, allow to stand for 10 minutes, and filter each through a dry filter, rejecting the first 30 cc. of each filtrate. Determine the excess of iodine in 100 cc. of each filtrate by titration with tenth-normal sodium thiosulfate. Calculate the number of cubic centimeters of tenth-normal iodine consumed in each titration: the difference between the two titrations is not less than 0.7 cc.

Packaging and storage—Preserve Activated Charcoal in well-closed containers.

Chiniofon

CHINIOFON

Chiniofonum

Chiniofon.

Chiniofon is a mixture of 7-iodo-8-hydroxyquinoline-5-sulfonic acid, its sodium salt, and sodium bicarbonate, containing not less than 26.5 per cent and not more than 29.0 per cent of iodine (I).

Description—Chiniofon occurs as a canary yellow powder with not more than a slight odor. It has a bitter taste, but leaves a distinctly sweetish after-taste.

Solubility—When moistened with water, Chiniofon effervesces, due to the reaction between the uncombined acid and the sodium bicarbonate. One Gm. of Chiniofon dissolves in 25 cc. of water. It is insoluble in alcohol, in ether, and in chloroform.

Identification—

A: The addition of mineral acids to Chiniofon produces effervescence and precipitates free iodohydroxyquinolinesulfonic acid.

B: To 10 cc. of a solution of Chiniofon (1 in 100) add 5 drops of ferric chloride T.S.: a deep emerald green color is produced.

C: To 10 cc. of a solution of Chiniofon (1 in 100) add 5 cc. of cupric sulfate T.S.: a dense, white precipitate is formed.

D: To 5 cc. of a solution of Chiniofon (1 in 100), add hydrochloric acid until slightly acid, then add 1 drop of sodium nitrite solution (1 in 10) and shake gently with 2 cc. of chloroform: the chloroform becomes violet in color.

Inorganic iodine—To 5 cc. of a solution of Chiniofon (1 in 100), add diluted hydrochloric acid until the reaction is slightly acid, then add a drop of ferric chloride T.S., and shake the mixture with 5 cc. of chloroform: no violet color appears in the chloroform layer.

Iodide—To 5 cc. of a solution of Chiniofon (1 in 100), add 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S.: at most only a slight opalescence is produced.

Assay—Place about 400 mg. of Chiniofon, accurately weighed, in a 500-cc. Erlenmeyer flask, and add 15 cc. of sodium hydroxide T.S. Warm gently, and when completely dissolved, add 25 cc. of a solution of potassium permanganate (1 in 15). Add several glass beads, place a small short-stemmed funnel in the mouth of the flask, and boil gently for 10 minutes. Allow the mixture to cool to room temperature, wash the funnel and walls of the flask with 75 cc. of water, and add 10 cc. of sulfuric acid (1 in 2). Add, in one portion, 15 cc. of a solution of sodium bisulfite (1 in 5), and, when the solution has become colorless, cool, and then add the solution of potassium permanganate, dropwise, until a yellow color appears. At once add the solution of sodium bisulfite, dropwise, until the yellow color is again discharged. Now add, dropwise, a dilute solution of potassium permanganate, prepared by mixing 1 cc. of the 1 in 15 solution with 49 cc. of water, until a faint yellow color appears. Add 0.5 cc. of starch T.S., and titrate with tenth-normal silver nitrate until the blue color is just discharged, leaving a canary yellow precipitate. Each cc. of tenth-normal silver nitrate is equivalent to 12.69 mg. of iodine (I).

Storage—Preserve Chiniofon in tight containers.

AVERAGE DOSE—1 Gm. (approximately 15 grains).

Chiniofon Tablets

CHINIOFON TABLETS

Tabellæ Chiniofoni

Tab. Chiniofon.

Chiniofon Tablets contain an amount of iodine (I) corresponding to not less than 25.0 per cent and to not more than 29.0 per cent of the labeled amount of chiniofon.

Identification—Powder a number of Chiniofon Tablets, equivalent to about 500 mg. of chiniofon, macerate the powder for 15 minutes with 30 cc. of water, and filter: the filtrate responds to the *Identification tests* under *Chiniofon*, page 120.

Inorganic iodine—To 10 cc. of the filtrate from the *Identification test* add 1 cc. of hydrochloric acid, filter, and add to the filtrate 2 cc. of chloroform and a few drops of ferric chloride T.S., and shake the mixture: the chloroform is not colored violet or pink.

Assay—Weigh a counted number of not less than 20 Chiniofon Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 400 mg. of chiniofon, and place it in a 500-cc. Erlenmeyer flask. Add 20 cc. of sodium hydroxide T.S., warm gently until no more dissolves, and add 25 cc. of a solution of potassium permanganate (1 in 15). Add several glass beads, place a small short-stem funnel in the flask, boil gently for 10 minutes, and proceed as directed in the *Assay* under *Chiniofon*, page 120, beginning with "Allow the mixture to cool to room temperature." Each cc. of tenth-normal silver nitrate is equivalent to 12.69 mg. of iodine (I).

Packaging and storage—Preserve Chiniofon Tablets in tight containers.
Sizes—Chiniofon Tablets usually available contain the following amount of chiniofon: 250 mg. (4 grains).

AVERAGE DOSE OF CHINIOFON—1 Gm. (approximately 15 grains).

Chloral Hydrate

CHLORAL HYDRATE

Chloralis Hydras

Chloral. Hydr.—Chloral

$C_2H_3Cl_3O_2$ $CCl_3CH(OH)_2$ Mol. wt. 165.42

Chloral Hydrate contains not less than 99.5 per cent of $C_2H_3Cl_3O_2$.

Description—Chloral Hydrate occurs as colorless, transparent, or white crystals, having an aromatic, penetrating, and slightly acrid odor, and a slightly bitter, caustic taste. It slowly volatilizes when exposed to air.

Solubility—One Gm. of Chloral Hydrate dissolves in 0.25 cc. of water, in 1.3 cc. of alcohol, in 2 cc. of chloroform, and in 1.5 cc. of ether. It is very soluble in olive oil and is freely soluble in turpentine oil.

Identification—

A: Chloral Hydrate is decomposed by alkali and alkali earth hydroxides, chloroform and a formate of the base being produced.

B: Warm Chloral Hydrate with a few drops each of aniline and of sodium hydroxide T.S.: the mixture has the intensely disagreeable odor of phenyl isocyanide. (*Caution: poisonous.*)

Acid—An alcohol solution of Chloral Hydrate (1 in 20) does not at once redden moistened blue litmus paper.

Residue on ignition—Chloral Hydrate yields not more than 0.10 per cent of residue on ignition, page 685.

Chloride—An alcohol solution of Chloral Hydrate (1 in 20) does not at once become opalescent on the addition of a few drops of silver nitrate T.S.

Readily carbonizable substances—Shake 500 mg. of Chloral Hydrate, at intervals of 5 minutes during 1 hour, with 5 cc. of sulfuric acid in a glass-stoppered cylinder that has previously been rinsed with sulfuric acid, and transfer the acid to a comparison vessel: the acid has no more color than matching fluid P, page 703.

Chloral alcoholate—Gently ignite 2 Gm. of Chloral Hydrate: no inflammable vapors are evolved.

Assay—Dissolve about 4 Gm. of Chloral Hydrate, accurately weighed, in 10 cc. of water, add 30 cc. of normal sodium hydroxide, and allow the mixture to stand for 2 minutes. Add a few drops of phenolphthalein T.S., and titrate the residual alkali at once with normal sulfuric acid. Each cc. of normal sodium hydroxide corresponds to 165.4 mg. of $C_2H_3Cl_3O_2$.

Packaging and storage—Preserve Chloral Hydrate in tight containers.

AVERAGE DOSE—**0.6 Gm.** (approximately 10 grains).

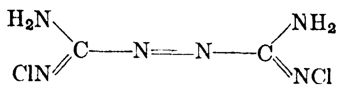
Chloroazodin

CHLOROAZODIN

Chloroazodinum

Chloroazodin.

$C_2H_4Cl_2N_6$



Mol. wt. 183.01

Chloroazodin contains the equivalent of not less than 37.5 per cent and not more than 39.5 per cent of active chlorine (Cl).

Description—Chloroazodin occurs as bright yellow needles or flakes. It has a faint odor suggestive of chlorine, and a slightly burning taste. Solutions of Chloroazodin in glycerin and in alcohol decompose rapidly on warming, and all solutions of Chloroazodin decompose on exposure to light. Chloroazodin decomposes explosively at about 155°. Its decomposition is accelerated by contact with metals.

Solubility—Chloroazodin is very slightly soluble in water. It is sparingly soluble in alcohol, slightly soluble in glycerin and in glyceryl triacetate, and very slightly soluble in chloroform.

Identification—

A: To 5 cc. of a saturated solution of Chloroazodin add 0.25 cc. of silver ammonium nitrate T.S.: a brick red precipitate forms, which is soluble upon the addition of an excess of ammonia T.S.

B: To 5 cc. of a saturated solution of Chloroazodin add 2 cc. of potassium iodide T.S. and 0.5 cc. of chloroform, and agitate the mixture: the chloroform layer which separates is colorless or has only a faint color. Add 0.1 cc. of diluted hydrochloric acid to the mixture: upon further shaking, the chloroform layer acquires a deep violet color.

C: To 5 cc. of a saturated solution of Chloroazodin add sulfurous acid T.S. dropwise until the yellow color is just discharged: the solution, when acidified with diluted nitric acid, responds to the tests for *Chloride*, page 659.

Residue on ignition—Place about 2 Gm. of Chloroazodin, accurately weighed, in a porcelain crucible, add 5 cc. of hydrochloric acid, and warm the mixture gently until no more chlorine is evolved. Add 1 cc. of diluted sulfuric acid, evaporate the solution to dryness, and ignite the residue to constant weight: not more than 0.1 per cent of residue remains.

Chloride—A solution of 10 mg. of Chloroazodin in 40 cc. of water shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 703.

Assay—Transfer about 120 mg. of Chloroazodin, accurately weighed, to a 250-cc. iodine flask, add, all at once, 20 cc. of glacial acetic acid, stopper the flask, and set aside until solution is complete. Add, over the loosened stopper, 10 cc. of potassium iodide T.S., again stopper the flask, mix the contents by swirling, and allow the mixture to stand in a dark place for 10 minutes. Add 50 cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding a few drops of starch T.S. as the end point is neared. Perform a blank test with the same re-

agents and in the same manner and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 1.182 mg. of Cl.
Packaging and storage—Preserve Chloroazodin in well-closed, light-resistant containers, preferably in a cold place.

Chloroazodin Solution

CHLOROAZODIN SOLUTION.

Liquor Chloroazodini

Liq. Chloroazodin.

Chloroazodin Solution contains, in each 100 cc., not less than 0.24 Gm. and not more than 0.28 Gm. of $C_2H_4Cl_2N_6$.

Caution—Chloroazodin Solution should not come in contact with metal.

CHLOROAZODIN....................................	2.6 Gm.
GLYCERYL TRIACETATE, a sufficient quantity,	
To make.........................	1000 cc.

Place the glyceryl triacetate in a carefully dried vessel of glass or other vitreous material which can be tightly closed and in which the solution can be stirred with a minimum of exposure to air. Add the chloroazodin, and stir until dissolved, avoiding all unnecessary exposure to air and to light. Close the vessel tightly, and set aside for at least 30 days, avoiding exposure to light. Filter with the aid of suction through filter paper or a glass or stoneware filter, and package immediately in tight containers.

Description—Chloroazodin Solution is a clear, yellow, somewhat oily liquid, having a slight fatty odor and a bitter taste.
Specific gravity—The specific gravity of Chloroazodin Solution is not less than 1.154 and not more than 1.158.
Identification—Add, with vigorous shaking, a few drops of silver ammonium nitrate T.S. to a mixture of 5 cc. of Chloroazodin Solution and 5 cc. of water: a brick red precipitate is produced, which is soluble in an excess of ammonia T.S.
Moisture—Determine the moisture present in 150 cc. of Chloroazodin Solution as directed under *Moisture Method by Toluene Distillation*, page 712: not more than 0.3 cc. of water is present.
Assay for chloroazodin—Measure accurately about 5 cc. of Chloroazodin Solution into a 250-cc. flask, and dilute it with 25 cc. of chloroform. Add 10 cc. of potassium iodide T.S., followed by 75 cc. of diluted acetic acid, and immediately titrate the liberated iodine with hundredth-normal sodium thiosulfate, shaking vigorously during the titration and adding a few drops of starch T.S. near the end of the titration. Perform a blank test with the same reagents and in the same manner

and make any necessary correction. Each cc. of hundredth-normal sodium thiosulfate is equivalent to 0.3050 mg. of $C_2H_4Cl_2N_6$.

Packaging and storage—Preserve Chloroazodin Solution in tight, light-resistant containers.

Chlorobutanol

CHLOROBUTANOL

Chlorobutanol

Chlorobut.—Chlorbutanol

$C_4H_7Cl_3O$ $Cl_3C.C(CH_3)_2.OH$ Mol. wt. 177.47

Chlorobutanol may be anhydrous or it may contain up to about one-half molecule of water.

Description—Chlorobutanol occurs as colorless to white crystals, having a characteristic, somewhat camphoraceous odor and taste.

Solubility—One Gm. of Chlorobutanol dissolves in 125 cc. of water, in about 1 cc. of alcohol, and in about 10 cc. of glycerin. It is readily soluble in ether, in chloroform, and in volatile oils.

Melting temperature—Chlorobutanol melts at a temperature not lower than 76°, page 667.

Identification—

A: To 5 cc. of a freshly prepared solution of Chlorobutanol (1 in 200) add 1 cc. of sodium hydroxide T.S., then slowly add 3 cc. of iodine T.S.: a yellow precipitate of iodoform appears, recognizable by its odor.

B: To 100 mg. of Chlorobutanol, contained in a test tube, add 5 cc. of sodium hydroxide T.S., and mix thoroughly; then add 3 or 4 drops of aniline, and warm gently: the disagreeable odor of phenyl isocyanide is produced. (*Caution: poisonous.*)

Acid—Shake thoroughly 500 mg. of Chlorobutanol with 25 cc. of water: the water remains neutral to litmus paper.

Residue on ignition—Chlorobutanol yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—Dissolve 500 mg. of Chlorobutanol in 25 cc. of diluted alcohol, and add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S.: the opalescence of the mixture is no greater than that of a mixture prepared by adding 1 cc. of silver nitrate T.S. to 0.5 cc. of fiftieth-normal hydrochloric acid and 1 cc. of nitric acid, diluted to a volume of 25 cc. with diluted alcohol.

Packaging and storage—Preserve Chlorobutanol in tight containers.

Labeling—The label shall indicate whether the Chlorobutanol is anhydrous or hydrous.

AVERAGE DOSE—**0.6 Gm.—Apothecaries, 10 grains.**

Chloroform

Chloroform

CHLOROFORM

Chloroformum

Chlorof.

$CHCl_3$ Mol. wt. 119.39

Chloroform contains not less than 99 per cent and not more than 99.5 per cent of $CHCl_3$, the remainder consisting of alcohol.

Caution—Care should be taken not to vaporize Chloroform in the presence of a naked flame, because of the production of noxious gases.

Description—Chloroform is a clear, colorless, mobile liquid, having a characteristic, ethereal odor, and a burning, sweet taste. It is not inflammable, but its heated vapor burns with a green flame. It boils at about 61°. It is affected by light.

Solubility—Chloroform dissolves in 210 volumes of water. It is miscible with alcohol, ether, benzene, petroleum benzin, and with fixed and volatile oils.

Specific gravity—The specific gravity of chloroform is not less than 1.474 and not more than 1.478, indicating not less than 99 per cent and not more than 99.5 per cent of $CHCl_3$.

Residue on evaporation—Evaporate 50 cc. of Chloroform in a platinum or porcelain dish on a water bath, and dry at 100° for 1 hour: the weight of the residue does not exceed 1 mg.

Acid, chloride ion and chlorine—Agitate 10 cc. of Chloroform with 25 cc. of recently boiled and cooled water, and allow the liquids to separate completely. The water layer is neutral to litmus paper, and separate portions of 10 cc. each are not affected by a few drops of silver nitrate T.S. (*chloride*), or colored blue by the addition of a few drops each of potassium iodide T.S., and starch T.S. (*free chlorine*).

Readily carbonizable substances—Transfer 40 cc. of Chloroform to a glass-stoppered separator, add 5 cc. of sulfuric acid, and shake the mixture vigorously for 5 minutes. Allow the liquids to separate completely: the Chloroform remains colorless. Transfer the acid to a comparison vessel: the acid has no more color than matching fluid A, page 680.

Odorous and chlorinated decomposition products—Dilute 2 cc. of the sulfuric acid separated from the Chloroform in the test for *Readily carbonizable substances* with 5 cc. of water: the liquid is colorless and clear, and while hot from the mixing emits but a faint vinous or ethereal odor (*odorous decomposition products*). When further diluted with 10 cc. of water, it remains clear, and is not affected within 1 minute by the addition of 3 drops of silver nitrate T.S. (*chlorinated decomposition products*).

Acid and phosgene—Into each of two 50-cc. glass-stoppered cylinders of colorless glass, having an internal diameter of 20 mm., place 10 cc. of water, 2 drops of phenolphthalein T.S., and enough hundredth-normal sodium hydroxide to produce, after vigorous shaking, pink tints of equal intensity. Into one of the cylinders measure exactly 20 cc. of Chloroform, and again shake the mixture well. Add hundredth-normal sodium hydroxide, dropwise from a burette, shaking the mixture well after each addition, until the pink color is reproduced in an intensity equal to that in the cylinder without the Chloroform. Not more than 0.20 cc. of hundredth-normal sodium hydroxide is required to produce a pink color which persists for 15 minutes.

Aldehyde and ketone—Agitate 3 cc. of Chloroform with 10 cc. of ammonia-free water in a glass-stoppered cylinder for 5 minutes. After the liquids separate, transfer 5 cc. of the water extract to another glass-stoppered cylinder containing 40 cc. of ammonia-free water, and add 5 cc. of alkaline mercuric potassium iodide T.S.: no turbidity or precipitate develops within 1 minute.

Foreign odor—Pour 20 cc. of Chloroform, in small portions, upon a piece of clean,

odorless, filter paper laid flat upon a warmed glass plate, and rock the plate from side to side until the liquid is completely evaporated: no foreign odor becomes perceptible as the last portions of liquid disappear from the paper, and the paper remains odorless.

Packaging and storage—Preserve Chloroform in tight, light-resistant containers. If cork stoppers are used, they should be covered with tin foil or other suitable material. It is recommended that Chloroform be kept at a temperature which does not exceed 30°.

CHLOROFORM LINIMENT

Linimentum Chloroformi

Lin. Chlorof.

Chloroform Liniment contains, at 25°, in each 100 cc., not less than 27 cc. and not more than 30.5 cc. of $CHCl_3$.

Chloroform	300 cc.
Camphor and Soap Liniment	700 cc.
To make	1000 cc.

Mix them by agitation.

Assay—Determine the chloroform in 20 cc. of Chloroform Liniment, accurately measured at 25°, as directed under *Chloroform Determination*, page 627. The volume of chloroform obtained, multiplied by 5, represents the volume of chloroform in 100 cc. of Chloroform Liniment.

Alcohol content—From 43 to 47 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Chloroform Liniment in tight containers, preferably at a temperature not above 30°.

CHOLERA VACCINE

Vaccinum Choleræ

Vac. Chol.

Cholera Vaccine is a sterile suspension of killed cholera vibrios (*Vibrio comma*), of strains selected for high antigenic efficiency, in isotonic sodium chloride solution or other suitable diluent. The Vaccine shall contain, in each cc., at least 8,000 million cholera organisms. Cholera Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Cholera Vaccine is a more or less turbid, whitish liquid, nearly odorless, or having a faint odor due to the presence of a preservative. It must be free from

harmful substances detectable by animal inoculation and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The outside label must indicate the number of organisms represented in each cc., the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by the National Institute of Health of the United States Public Health Service.

Preservation and storage—Preserve Cholera Vaccine at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

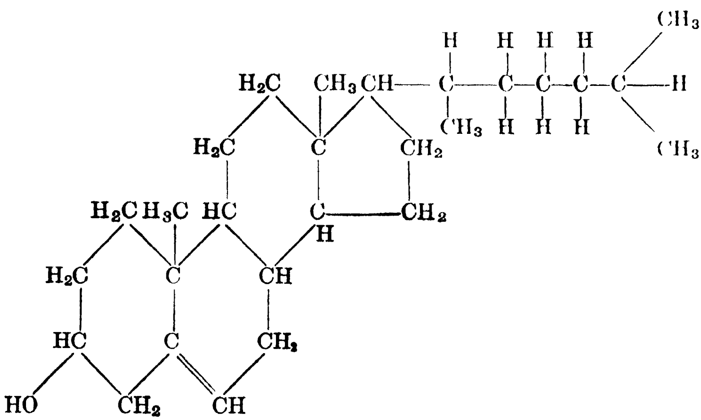
AVERAGE DOSE—Hypodermic, for active immunization, **0.5 cc.** and **1 cc.**, with a 7 to 10 days' interval, the latter dose preferably to be repeated once.

Cholesterol

CHOLESTEROL

Cholesterol

Cholest.—Cholesterin



$C_{27}H_{46}O$ Mol. wt. 386.64

Description—Cholesterol occurs as white or faintly yellow, almost odorless, pearly leaflets or granules. It usually acquires a yellow to pale tan color on prolonged exposure to light or to elevated temperatures.

Solubility—Cholesterol is insoluble in water and sparingly soluble in alcohol; it is soluble in acetone, in hot alcohol, in chloroform, in ether, in ethyl acetate, in petroleum benzin and in vegetable oils.

Melting range—Cholesterol melts between 147° and 150°.

Specific rotation—The specific rotation, $[\alpha]^{25}_{D}$, of Cholesterol, determined in a solution in dehydrated alcohol containing, in each 100 cc., 2 Gm. of Cholesterol, and using a 200-mm. tube, is not less than −28° and not more than −31.0°.

Identification—
A: To a solution of 10 mg. of Cholesterol in 1 cc. of chloroform add 1 cc. of sulfuric acid: the chloroform acquires a blood-red color and the sulfuric acid shows a green fluorescence.
B: Dissolve about 5 mg. of Cholesterol in 2 cc. of chloroform, add 1 cc. of acetic anhydride, and follow with 1 drop of sulfuric acid: a pink color is produced which rapidly changes to red, then to blue, and finally to a brilliant green.

Loss on drying—When dried at 100° for 3 hours, Cholesterol loses not more than 0.3 per cent of its weight.

Residue on ignition—Cholesterol yields not more than 0.1 per cent of residue on ignition.

Acid—Dissolve 1.0 Gm. of Cholesterol in 10 cc. of ether in a small flask, add 10 cc. of tenth-normal sodium hydroxide, and shake for about 1 minute. Heat gently to expel the ether and then boil for 5 minutes. Cool, dilute with 10 cc. of water, and titrate with tenth-normal sulfuric acid, using 2 drops of phenolphthalein T.S. as the indicator. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction: not less than 7 cc. of tenth-normal sulfuric acid is consumed.

Solubility in alcohol—Dissolve 500 mg. of Cholesterol in 50 cc. of warm alcohol and allow to stand for 2 hours: no deposit or turbidity is formed.

Packaging and storage—Preserve Cholesterol in well-closed, light-resistant containers, and avoid exposure to excessive heat.

Chromium Trioxide

CHROMIUM TRIOXIDE

Chromii Trioxidum

Chrom. Triox. Chromic Anhydride, "Chromic Acid"

CrO_3 Mol. wt. 100.01

Chromium Trioxide contains not less than 98 per cent of CrO_3.

Caution—*Chromium Trioxide should not be brought into intimate contact with organic substances, as serious explosions are likely to result.*

Description—Chromium Trioxide occurs as dark purplish red crystals, often needle-like, or in flakes. It is deliquescent, and is destructive to animal and vegetable tissues.

Solubility—One Gm. of Chromium Trioxide dissolves in 0.6 cc. of water.

Identification—
A: When Chromium Trioxide is warmed with hydrochloric acid, chlorine is evolved.
B: Chromium Trioxide responds to the tests for *Chromate*, page 660.

Alkali salts—Carefully ignite 500 mg. of Chromium Trioxide in a porcelain crucible, cool, and triturate with 10 cc. of hot water. Filter through a small paper, using 10 cc. of hot water to wash the residue in the crucible and on the filter paper. Evaporate the filtrate to dryness, and ignite the residue. Treat the residue with 10 cc. of water, filter, wash with 5 cc. of hot water, evaporate the filtrate to dryness, and ignite to constant weight: the weight of the residue does not exceed 2 mg.

Sulfate—Dissolve 1 Gm. of Chromium Trioxide in 100 cc. of water, previously acidulated with 3 cc. of hydrochloric acid, and add 1 cc. of barium chloride T.S.: the solution does not become turbid within 1 minute.

Assay—Dissolve about 1.5 Gm. of Chromium Trioxide, accurately weighed in a stoppered weighing bottle, in 10 cc. of water, transfer to a 100-cc. volumetric flask, and add sufficient water to make the solution measure 100 cc. Place in a 500-cc.

glass-stoppered Erlenmeyer flask 4 Gm. of potassium iodide, and 100 cc. of water. When the potassium iodide is dissolved, add 5 cc. of hydrochloric acid slowly and exactly 10 cc. of the Chromium Trioxide solution. Insert the stopper, mix well, and set aside in the dark for 5 minutes. Add 200 cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. *Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary correction.* Each cc. of tenth-normal sodium thiosulfate is equivalent to 3.334 mg. of CrO_3.

Packaging and storage—Preserve Chromium Trioxide in tight containers.

Chrysarobin

CHRYSAROBIN
Chrysarobinum
Chrysarob.

Chrysarobin is a mixture of neutral principles obtained from Goa powder, a substance deposited in the wood of *Andira Araroba* Aguiar (Fam. *Leguminosæ*).

Description—Chrysarobin occurs as a brown to orange yellow, microcrystalline powder. It is odorless or has a slight odor and is tasteless. It is irritating to the mucous membrane.

Solubility—Chrysarobin is very slightly soluble in water. One Gm. of it dissolves in 400 cc. of alcohol and in about 160 cc. of ether. One Gm. dissolves in about 15 cc. of chloroform, usually leaving a small amount of residue.

Identification—

A: Chrysarobin dissolves in solutions of alkali hydroxides, producing deep red solutions.

B: Chrysarobin dissolves in sulfuric acid, producing a deep red solution. When the solution is poured into water, the Chrysarobin separates from the mixture.

C: Mix about 2 mg. of Chrysarobin with 2 drops of fuming nitric acid: the mixture is red brown. Add a few drops of ammonia T.S.: the color changes to violet red (chrysophanic acid produces a yellow color).

Residue on ignition—Chrysarobin yields not more than 0.3 per cent of residue on ignition, page 685.

Acid—Boil 100 mg. of Chrysarobin with 20 cc. of water, and filter the mixture: the filtrate is neutral to litmus paper.

Packaging and storage—Preserve Chrysarobin in well-closed containers.

Chrysarobin Ointment

CHRYSAROBIN OINTMENT
Unguentum Chrysarobini
Ung. Chrysarob.

CHRYSAROBIN	60 Gm.
CHLOROFORM	70 Gm.
YELLOW OINTMENT	870 Gm.
To make about	1000 Gm.

Triturate the chrysarobin with the chloroform, and gradually incorporate the previously melted yellow ointment, stirring until the mixture congeals. So far as possible avoid the loss of chloroform by evaporation (see page 2)

CINNAMON

Cinnamomum

Cinnam.—Saigon Cinnamon

Cinnamon is the dried bark of *Cinnamomum Loureirii* Nees (Fam. *Lauraceæ*).

Cinnamon yields, from each 100 Gm., not less than 2.5 cc. of volatile oil.

Description—

Unground Cinnamon—In quills up to 30 cm. long and 4 cm. in diameter, the bark from 0.5 to 7.0 mm. in thickness, or in broken irregular pieces or in flattened slabs up to 10 mm. in thickness; the outer surface light brown to dark purplish brown, often with grayish patches of crustose lichens and numerous bud-scars, finely longitudinally wrinkled when from young twigs, otherwise, more or less rough from corky patches surrounding the lenticels; inner surface reddish brown to dark brown, granular and slightly striate; fracture short; odor characteristic and aromatic; taste sweetish, aromatic and pungent.

Histology—A narrow outer layer of more or less lignified cork cells followed by a cortex of starch-bearing parenchyma with scattered stone cells, mucilage and oil cells and a pericycle containing a nearly continuous zone of stone cells among which are small groups of pericyclic fibers with thickened and slightly lignified walls; inner bark with medullary rays 1 to 3 cells wide, inconspicuous sieve tissue, bast-fibers isolated and in groups of 2 to 20, mucilage and oil cells numerous and about the size of the parenchyma cells; parenchyma cells usually filled with starch or containing very small raphides of calcium oxalate; the lumina of parenchyma cells, stone cells and fibers frequently filled with an amorphous reddish brown substance, which is for the most part insoluble in the ordinary reagents. In the bark of the young twigs there is an epidermal layer with a thick, yellowish cuticle, fewer stone cells in the pericycle, the inner bark narrower and with fewer secretion cells than in the older bark.

Powdered Cinnamon—Yellowish brown or reddish brown; starch grains numerous; single and 2- to 4-compound, the single grains from 5 to 25 microns in diameter; stone cells irregular in shape, occasionally with one wall much thinner than the other walls, sometimes containing starch; fibers from 300 to 1500 microns in length, with very thick, more or less wavy and slightly lignified walls; parenchyma cells with reddish brown walls; oil cells and mucilage cells not readily distinguishable; fragments of somewhat lignified cork.

Foreign organic matter—The amount of *Foreign organic matter* in Cinnamon does not exceed 2 per cent, pages 710 and 711.

Assay—Proceed as directed for *Volatile Oil Determination*, page 715.
Packaging and storage—Preserve Cinnamon in well-closed containers, preferably in a cool, dry place.

Cinnamon Oil

CINNAMON OIL

Oleum Cinnamomi

Ol. Cinnam.—Cassia Oil

Cinnamon Oil is the volatile oil distilled with steam from the leaves and twigs of *Cinnamomum Cassia* (Nees) Nees ex Blume (Fam. *Lauraceæ*), rectified by distillation. It contains not less than 80 per cent, by volume, of the total aldehydes of Cinnamon Oil.

Description—Cinnamon Oil is a yellowish or brownish liquid, becoming darker and thicker by age or by exposure to air, and having the characteristic odor and taste of cassia cinnamon. A solution of recently rectified Cinnamon Oil in 70 per cent alcohol (1 in 2) is slightly acid to moistened blue litmus paper.
Solubility—Cinnamon Oil is soluble in an equal volume of alcohol, in 2 volumes of 70 per cent alcohol, and in an equal volume of glacial acetic acid.
Specific gravity—The specific gravity of Cinnamon Oil is not less than 1.045 and not more than 1.063.
Optical rotation—The optical rotation of Cinnamon Oil is not more than $-1°$ and not more than $+1°$ in a 100-mm. tube at 25°, page 675.
Refractive index—The refractive index of Cinnamon Oil is not less than 1.6020 and not more than 1.6135 at 20°, page 682.
Heavy metals—Cinnamon Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 658.
Halogens—Rinse the interior surface of a well-cleaned, 1000-cc. beaker with successive portions of water, passing the washings through a small filter until the last filter washing, acidified with 1 drop of nitric acid and treated with 1 drop of silver nitrate T.S., shows no turbidity. Place 3 or 4 drops of Cinnamon Oil on a clean watch glass supported on a triangle, ignite the Oil, and immediately invert the moistened beaker over it. Wash the products of combustion from the sides of the beaker through the washed filter with from 10 to 20 cc. of water, acidify the filtrate with 1 drop of nitric acid, and add 1 drop of silver nitrate T.S.: the mixture does not become turbid.
Rosin or rosin oils—Shake 2 cc. of Cinnamon Oil in a test tube with from 5 to 10 cc. of petroleum benzin, allow the liquids to separate, decant the benzin layer, which is but slightly colored, into another test tube, and shake it with an equal volume of cupric acetate solution (1 in 1000): the mixture does not assume a green color.
Assay for total aldehydes—Place 10 cc. of Cinnamon Oil, measured from a pipette, in a 100-cc. cassia flask, and add 50 cc. of a saturated solution of sodium sulfite, which has been carefully rendered neutral to 2 drops of phenolphthalein T.S. by means of a 30 per cent sodium bisulfite solution. Heat the mixture in a bath containing boiling water, and shake the flask repeatedly, neutralizing the mixture from time to time by the addition of a few drops of the 30 per cent sodium bisulfite solution. When no coloration appears upon the addition of a few more drops of phenolphthalein T.S. and heating for 15 minutes, cool the mixture to room temperature, and, when the liquids have separated completely, add sufficient sodium

sulfite solution to raise the lower limit of the oily layer within the graduated portion of the neck. The volume of the oily layer does not exceed 2 cc., indicating the presence in the Oil of not less than 80 per cent, by volume, of total aldehydes.

Packaging and storage—Preserve Cinnamon Oil in well-filled, tight containers and avoid exposure to excessive heat.

AVERAGE DOSE—**0.1 cc.** (approximately 1½ minims).

CINNAMON SPIRIT

Spiritus Cinnamomi

Sp. Cinnam.

Cinnamon Spirit contains, in each 100 cc., not less than 9 cc. and not more than 11 cc. of cinnamon oil.

CINNAMON OIL	100 cc.
ALCOHOL, a sufficient quantity,	
To make	1000 cc.

Mix the oil with sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 5 cc. of Cinnamon Spirit to a Babcock bottle, graduated to 8 per cent. Attach the bottle to a suction pump, and, while maintaining a relatively high degree of vacuum, evaporate most of the alcohol by repeatedly but carefully immersing the bottle in hot water and immediately withdrawing it. Throughout the operation the bottle must be vigorously rotated, and care must be taken that none of the liquid is drawn out. When most of the alcohol has been removed, cool the liquid, and add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Add sufficient saturated calcium chloride solution, acidified with hydrochloric acid, almost to fill the bulb of the bottle, rotate it vigorously to insure thorough mixing, and add sufficient of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and then read the volume of oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 4.2 to obtain the volume of cinnamon oil in 100 cc. of the Spirit.

Alcohol content—From 80 to 87 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Cinnamon Spirit in tight containers, protected from light.

AVERAGE DOSE—**1 cc.** (approximately 15 minims).

Cinnamon Water

CINNAMON WATER

Aqua Cinnamomi

Aq. Cinnam.

Cinnamon Water is a clear, saturated solution of cinnamon oil in distilled water, prepared by one of the processes described under *Waters*, page 726.

	PAGE
Citrated Caffeine	90
Citrated Normal Human Plasma	417

Citric Acid

CITRIC ACID

Acidum Citricum

Acid. Cit.

$$C_6H_8O_7.H_2O \qquad \begin{array}{l} CH_2.COOH \\ \quad | \\ HO.C.COOH \quad .H_2O \\ \quad | \\ CH_2.COOH \end{array} \qquad \text{Mol. wt. } 210.14$$

Citric Acid contains not less than 99.7 per cent of $C_6H_8O_7.H_2O$.

Description—Citric Acid occurs as colorless, translucent crystals, or as a white, granular to fine, crystalline powder. It is odorless, has a strongly acid taste, and is efflorescent in dry air.

Solubility—One Gm. of Citric Acid dissolves in 0.5 cc. of water, in 2 cc. of alcohol, and in about 30 cc. of ether.

Identification—A solution of Citric Acid responds to the tests for *Citrate*, page 660.

Residue on ignition—Citric Acid yields not more than 0.05 per cent of residue on ignition, page 685.

Oxalate—Neutralize 10 cc. of a solution of Citric Acid (1 in 10) with ammonia T.S., add 5 drops of diluted hydrochloric acid, cool, and add 2 cc. of calcium chloride T.S.: no turbidity is produced.

Sulfate—Add 1 cc. of barium chloride T.S. to 10 cc. of a solution of the Acid (1 in 100), to which has been added 1 drop of hydrochloric acid: no turbidity is produced.

Heavy metals—Dissolve 2 Gm. of Citric Acid in 10 cc. of water, and add 1 drop of phenolphthalein T.S., followed by ammonia T.S. until the solution is faintly pink. Dilute to 23 cc. with water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Citric Acid is 10 parts per million.

Readily carbonizable substances—Mix 500 mg. of powdered Citric Acid with 5 cc. of sulfuric acid in a test tube that has been previously rinsed with sulfuric acid, and maintain the temperature of the mixture at 90° for 1 hour: the color of the mixture is not darker than that of matching fluid K, page 680.

Assay—Place about 3 Gm. of Citric Acid in a tared flask and weigh accurately. Dissolve the Acid in 40 cc. of water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 70.05 mg. of $C_6H_8O_7.H_2O$.

Packaging and storage—Preserve Citric Acid in tight containers.

CITRIC ACID SYRUP

Syrupus Acidi Citrici

Syr. Acid. Cit.

Lemon Tincture	10 cc.
Citric Acid	10 Gm.
Distilled Water	10 cc.
Syrup, a sufficient quantity,	
To make	1000 cc.

Dissolve the citric acid in the distilled water and mix the solution with 950 cc. of syrup. Add the tincture and enough syrup to make the product measure 1000 cc. Mix thoroughly.

This preparation must not be dispensed if it has a terebinthinate odor or taste or shows other indications of deterioration.

Alcohol content—Less than 1 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Citric Acid Syrup in tight containers, preferably at a temperature not above 25°.

CLOVE

Caryophyllus

Caryoph.—Cloves

Clove is the dried flower-bud of *Eugenia caryophyllata* Thunberg (Fam. *Myrtaceæ*).

Clove yields, from each 100 Gm., not less than 16 cc. of clove oil.

Description—
Unground Clove—From 10 to 17.5 mm. in length, of a dark brown, or dusky red color, consisting of a sub-cylindrical, slightly flattened, four-sided hypanthium which contains in its upper portion a 2-celled, inferior ovary with numerous ovules attached to a central placenta, the hypanthium terminated by 4 thick, divergent sepals and surmounted by a nearly globular head, consisting of 4 membranous, inbricated petals, which enclose numerous curved stamens and 1 style; odor strongly aromatic; taste pungent and aromatic, followed by a slight numbness of the tongue.

Stems sub-cylindrical or 4-angled, attaining a length of 25 mm. and a diameter of 4 mm., either simple, branching, or distinctly jointed, and less aromatic than the flower buds.

Powdered Clove—Dark brown; parenchyma fragments showing the large oval schizolysigenous oil reservoirs, spiral tracheæ and a few rather thick-walled,

spindle-shaped fibers; calcium oxalate in rosette aggregates, from 10 to 15 microns in diameter; fragments of the walls of anthers with characteristic reticulated cells; pollen grains numerous, tetrahedral, from 15 to 20 microns in diameter.

Other foreign matter—The amount of *Foreign matter* in Clove, other than stems, does not exceed 1 per cent, pages 710 and 711.

Crude fiber—Clove yields not more than 10 per cent of *Crude fiber*, pages 710 and 713.

Acid-insoluble ash—Clove yields not more than 0.75 per cent of *Acid-insoluble ash* pages 710 and 711.

Clove stems—Stone cells, irregular or polygonal, up to about 70 microns in diameter, with thick, porous walls and large lumina, sometimes filled with an orange or yellow amorphous substance, are few or absent (not more than 5 per cent of *clove stems*).

Clove fruit or cereals—Starch grains are absent.

Assay—Proceed as directed for *Volatile Oil Determination*, pages 710 and 715.

Packaging and storage—Preserve Clove in well-closed containers and avoid exposure to excessive heat.

Clove Oil

CLOVE OIL

Oleum Caryophylli

Ol. Caryoph.

Clove Oil is the volatile oil distilled with steam from the dried flower buds of *Eugenia caryophyllata* Thunberg (Fam. *Myrtaceæ*). It contains not less than 82 per cent by volume of eugenol ($C_{10}H_{12}O_2$).

Description—Clove Oil is a colorless or pale yellow liquid, becoming darker and thicker by age or exposure to air, and having the characteristic odor and taste of clove. A solution of recently distilled Clove Oil in 70 per cent alcohol (1 in 2) is slightly acid to moistened blue litmus paper.

Solubility—Clove Oil is soluble in 2 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Clove Oil is not less than 1.038 and not more than 1.060.

Optical rotation—The optical rotation of Clove Oil is not more than $-1° 30'$ in a 100-mm. tube at 25° C., page 675.

Refractive index—The refractive index of Clove Oil is not less than 1.5300 and not more than 1.5350 at 20°, page 682.

Heavy metals—Clove Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 658.

Phenol—Shake 1 cc. of Clove Oil with 20 cc. of hot water: the water shows not more than a scarcely perceptible acid reaction with blue litmus paper. Cool the mixture, pass the water layer through a wetted filter, and treat the clear filtrate with 1 drop of ferric chloride T.S.: the mixture has only a transient, grayish-green color, but not a blue or violet color.

Assay—Place 10 cc. of Clove Oil, measured from a pipette, in a 100-cc. cassia flask, add 75 cc. of normal potassium hydroxide solution, shake the mixture for 5 minutes, and heat it for 10 minutes in a bath containing boiling water. Remove it from the bath, and cool to room temperature. When the liquids have separated completely, add sufficient normal potassium hydroxide to raise the lower limit of the oily layer within the graduated portion of the neck: the volume of the oily layer should not exceed 1.8 cc., indicating the presence in the Oil of not less than 82 per cent, by volume, of $C_{10}H_{12}O_2$.

Packaging and storage—Preserve Clove Oil in well-filled, tight containers and avoid exposure to excessive heat.

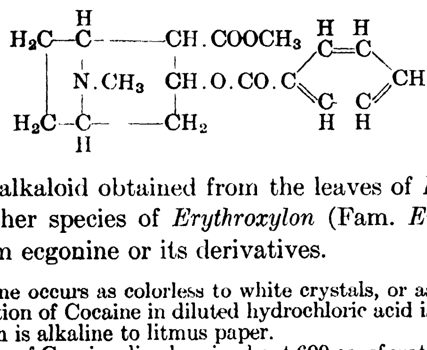
Cocaine

COCAINE

Cocaina

Cocain.

$C_{17}H_{21}NO_4$



Mol. wt. 303.35

Cocaine is an alkaloid obtained from the leaves of *Erythroxylon Coca* Lamarck and other species of *Erythroxylon* (Fam. *Erythroxylaceæ*), or by synthesis from ecgonine or its derivatives.

Description—Cocaine occurs as colorless to white crystals, or as a white, crystalline powder. A solution of Cocaine in diluted hydrochloric acid is laevorotatory. Its saturated solution is alkaline to litmus paper.

Solubility—One Gm. of Cocaine dissolves in about 600 cc. of water, in 7 cc. of alcohol, in 1 cc. of chloroform, in 3.5 cc. of ether, in about 12 cc. of olive oil, and in from 80 to 100 cc. of liquid petrolatum. It is very soluble in warm alcohol.

Melting range—Cocaine melts between 96° and 98°, page 667.

Identification—

A: Heat about 100 mg. of powdered Cocaine with 1 cc. of sulfuric acid for 5 minutes at 100°, then cautiously mix with 2 cc. of water: the mixture has the aromatic odor of methyl benzoate and, upon cooling, yields crystals of benzoic acid.

B: Dissolve 100 mg. of Cocaine in 0.4 cc. of normal hydrochloric acid and enough water to make 5 cc., and add 5 drops of a solution of chromium trioxide (1 in 20): a yellow precipitate is produced which redissolves on shaking the mixture. On the subsequent addition of 1 cc. of hydrochloric acid a permanent, orange-colored, crystalline precipitate is formed.

C: Dissolve 10 mg. of Cocaine in 1 cc. of fiftieth-normal hydrochloric acid, and evaporate the solution just to dryness on a water bath. Dissolve the residue in 2 drops of water, and add 1 cc. of tenth-normal potassium permanganate:

a violet, crystalline precipitate forms, which appears brownish violet when collected on a filter, and shows characteristic violet red crystalline aggregates under the low power of a microscope.

Loss on Drying—When dried over sulfuric acid for 3 hours, Cocaine loses not more than 1 per cent of its weight.

Residue on ignition—The residue on ignition from 500 mg. of Cocaine is negligible, page 685.

Readily carbonizable substances—Dissolve 500 mg. of Cocaine in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Cinnamyl-cocaine and other reducing substances—Dissolve 300 mg. of finely powdered Cocaine in 1 cc. of normal hydrochloric acid with the aid of heat, if necessary, and dilute with water to 15 cc. Mix 5 cc. of this solution with 0.3 cc. of normal sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate: the violet color of the mixture does not disappear entirely within 30 minutes.

Isoatropyl-cocaine—Dilute in a beaker 5 cc. of the solution of Cocaine prepared in the test for *cinnamyl-cocaine* with 80 cc. of water, add 0.2 cc. of ammonia T.S., and stir the solution vigorously during 5 minutes, occasionally rubbing the inner wall of the beaker with a stirring rod: a crystalline precipitate of cocaine develops, and the supernatant liquid is clear.

Packaging and storage—Preserve Cocaine in well-closed, light-resistant containers.

Cocaine Hydrochloride

COCAINE HYDROCHLORIDE

Cocainæ Hydrochloridum

Cocain. Hydrochlor.—Cocaini hydrochloridum P.I.

$C_{17}H_{21}NO_4.HCl$ Mol. wt. 339.81

Description—Cocaine Hydrochloride occurs as colorless crystals, or as a white, crystalline powder.

Solubility—One Gm. of Cocaine Hydrochloride dissolves in 0.5 cc. of water, in 3.5 cc. of alcohol, and in 15 cc. of chloroform. It is soluble in glycerin and insoluble in ether.

Specific rotation—The specific rotation, $[\alpha]^{25}_{D}$, of Cocaine Hydrochloride, determined in a solution containing the equivalent of 2 Gm. of the salt, previously dried for 3 hours over sulfuric acid, in 100 cc. of the solution and using a 200-mm. tube, is not less than $-71°$ and not more than $-73°$, page 675.

Identification—

A: Heat about 100 mg. of powdered Cocaine Hydrochloride with 1 cc. of sulfuric acid for 5 minutes at 100°, then cautiously mix with 2 cc. of water: the mixture has the aromatic odor of methyl benzoate and on cooling yields crystals of benzoic acid.

B: Add 5 drops of a solution of chromium trioxide (1 in 20) to 5 cc. of a solution of Cocaine Hydrochloride (1 in 50): a yellow precipitate is produced which redissolves on shaking the mixture. On the subsequent addition of 1 cc. of hydrochloric acid, a permanent, orange-colored crystalline precipitate is formed.

C: A solution of about 10 mg. of Cocaine Hydrochloride in 2 drops of water yields, on the addition of 1 cc. of tenth-normal potassium permanganate, a violet, crystalline precipitate which appears brownish violet when collected on a filter, and shows characteristic, violet red crystalline aggregates under the low power of a microscope.

D: Silver nitrate T.S. produces, in a solution of Cocaine Hydrochloride (1 in 20), a white precipitate insoluble in nitric acid.

Free acid—A solution of 500 mg. of Cocaine Hydrochloride in 10 cc. of water requires not more than 0 5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried over sulfuric acid for 3 hours, Cocaine Hydrochloride loses not more than 1 per cent of its weight.

Residue on ignition—The residue on ignition from 500 mg. of Cocaine Hydrochloride is negligible, page 685.

Readily carbonizable substances—Dissolve 500 mg. of Cocaine Hydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid F, page 680.

Cinnamyl-cocaine and other reducing substances—Mix 5 cc. of a solution of Cocaine Hydrochloride (1 in 50) with 0.3 cc. of normal sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate: the violet color of the mixture does not disappear entirely within 30 minutes.

Isoatropyl-cocaine—Dilute 5 cc. of a solution of Cocaine Hydrochloride (1 in 50) in a beaker with 80 cc. of water, add 0.2 cc. of ammonia T.S., and stir the solution vigorously during 5 minutes, occasionally rubbing the inner wall of the beaker with a stirring rod: a crystalline precipitate of cocaine develops, and the supernatant liquid is clear.

Packaging and storage—Preserve Cocaine Hydrochloride in well-closed, light-resistant containers.

Cochineal

COCHINEAL

Coccus

Cochineal consists of the dried female insects, *Coccus cacti* Linné (Fam. *Coccidæ*), enclosing the young larvæ.

Description—

Unground Cochineal—Somewhat ovate in outline, dorsal surface convex, and showing from 9 to 12 segments, ventral surface concave, from 3.5 to 6 mm. in length; externally grayish to grayish purple or purplish black to very dusky red purple; the ventral surface showing two straight, 7-jointed antennæ located in the anterior end, three pairs of short legs each terminating in a single claw and a highly modified mouth showing externally a long filiform proboscis composed of four very fine chitinous styles, in two pairs, the anterior pair representing the mandibles and the posterior pair representing the first maxillæ; the antennæ, legs and mouth parts being more or less broken; four spiracles are visible, an anterior pair between the middle and hind legs; entire surface more or less chitinous and showing numerous solitary or clustered, tubular or spinneret wax glands; the insect, after decolorization, exhibiting numerous larvæ characterized by their proboscides appearing as two circular coils, rows of tubular wax glands, and in the more developed stages, three pairs of legs, antennæ and other features of the mature insect; easily pulverizable; odor characteristic; taste slightly bitter.

Powdered Cochineal—Very dusky to very dark red; showing fragments of muscle fibers; portions of the chitinous epidermis with wax glands; fragments of larvæ with coiled proboscides; occasional claws and segments of the legs; fragments of antennæ and other parts described under the unground drug.

Identification—The red color of Cochineal solutions is changed to reddish purple by alkalies and to weak orange by acids.

Weighting materials—When whole Cochineal is macerated in water, no insoluble powder separates.

Packaging and storage—Preserve Cochineal in well-closed containers.

Cod Liver Oil

COD LIVER OIL

Oleum Morrhuæ

Ol. Morrh.

Cod Liver Oil is the partially destearinated fixed oil obtained from fresh livers of *Gadus morrhua* Linné and other species of the Family *Gadidæ*. Cod Liver Oil contains in each Gm. not less than 850 U. S. P. Units of Vitamin A and not less than 85 U. S. P. Units of Vitamin D.

Cod Liver Oil may be flavored by the addition of not more than 1 per cent of any flavoring substance or any mixture of such flavoring substances recognized in this Pharmacopœia.

Description—Cod Liver Oil is a thin, oily liquid, and has a characteristic, slightly fishy, but not a rancid, odor, and a fishy taste.

Solubility—Cod Liver Oil is slightly soluble in alcohol, but is freely soluble in ether, in chloroform, in carbon disulfide, and in ethyl acetate.

Specific gravity—The specific gravity of Cod Liver Oil is not less than 0.918 and not more than 0.927.

Color—When viewed transversely in a tall, cylindrical, standard oil-sample bottle of colorless glass of about 120-cc. capacity, the color of Cod Liver Oil shall not be more intense than that of a mixture of 11 cc. of cobaltous chloride C.S., 76 cc. of ferric chloride C.S. and 33 cc. of water, in a similar bottle of the same internal diameter.

Non-destearinated cod liver oil—Fill a tall, cylindrical, standard oil-sample bottle of about 120-cc. capacity with Cod Liver Oil at a temperature between 23° and 28°, stopper, and immerse the bottle in a mixture of ice and water for 3 hours: the oil remains clear and does not deposit stearin.

Unsaponifiable matter—Cod Liver Oil contains not more than 1.3 per cent of unsaponifiable matter, page 648.

Acid value—Dissolve 2 Gm. of Cod Liver Oil, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator. Boil the oil solution gently under a reflux condenser for 10 minutes, cool, and titrate the mixture with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Iodine value—The iodine value of Cod Liver Oil is not less than 145 and not more than 180, page 647.

Saponification value—The saponification value of Cod Liver Oil is not less than 180 and not more than 192, page 647. When carbon dioxide has been used as a preservative, the Oil must be exposed in a shallow dish in a vacuum desiccator for 24 hours before weighing the sample for determination of the saponification value.

Spectrophotometric absorption value—When examined spectrophotometrically in comparison with the U. S. P. Vitamin A Reference Standard, the absorption value at 3280 Ångströms of an unknown oil (absorption for any concentration of solution is here defined as $\log \frac{I_O}{I}$ where I_O is the light incident upon the solution and I is the light transmitted through the solution) shall be not less than 95 per cent of $\frac{850}{\text{Reference oil potency}} \times$ Reference oil absorption when both the absorption of the reference oil and oil in question are calculated to the same per cent concentration and for the same absorption cell or practically identical absorption cells.

Absorption at 3280 Ångströms of a per cent of unknown oil must equal or exceed

$$\frac{0.95 \times 850}{\text{Potency of reference oil}} \times \text{Absorption of a per cent of reference oil.}$$

Assay—Proceed as directed under *Vitamins A and D Assays*, page 718.

Packaging and storage—Preserve Cod Liver Oil in tight containers. Cod Liver Oil may be bottled or packaged in containers from which air has been expelled by the production of a vacuum or by an inert gas.

Labeling—The Vitamin A potency and Vitamin D potency of Cod Liver Oil, when designated on the label, shall be expressed in "United States Pharmacopœia Units" per gram of oil; these units may be referred to as "U.S.P. Units."

AVERAGE DAILY DOSE—Infants and adults, 8 cc. (approximately 2 fluidrachms).

NOTE—Cod Liver Oil containing more than the minimum U.S.P. requirements for both vitamin A and vitamin D may be administered in proportionally smaller doses.

Cod Liver Oil Emulsion

COD LIVER OIL EMULSION

Emulsum Olei Morrhuae

Emuls. Ol. Morrh.

COD LIVER OIL	500 cc.
ACACIA, in very fine powder	125 Gm.
SYRUP	100 cc.
METHYL SALICYLATE	4 cc.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Quickly and thoroughly mix the acacia with the cod liver oil in a dry mortar or other suitable vessel, then add at once 250 cc. of distilled water, and complete the emulsification by trituration or by the aid of a suitable mechanical device. When a thick, white, homogeneous emulsion is obtained, add the methyl salicylate and the syrup in small portions, mixing thoroughly after each addition, and in the same manner add sufficient distilled water to make the product measure 1000 cc.

Alcohol content (when present)—From 5 to 7 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Cod Liver Oil Emulsion in tight containers.
Note—The methyl salicylate may be replaced by not more than 1 per cent of any other flavoring substance or by any mixture of flavoring substances recognized in this Pharmacopœia. If a preservative is needed, 60 cc. of alcohol may be used, replacing a like quantity of distilled water, or, instead of the alcohol, 60 cc. of sweet orange peel tincture or 2 Gm. of benzoic acid may be used. For other permissible variations, see *Emulsions*, page 643.

AVERAGE DAILY DOSE—Infants and adults, **15 cc.** (approximately 4 fluidrachms).

NOTE—Cod Liver Oil Emulsion prepared from Oil containing more than the minimum U. S. P. requirements for both Vitamin A and Vitamin D may be administered in proportionally smaller doses.

Cod Liver Oil, Non-destearinated

NON-DESTEARINATED COD LIVER OIL

Oleum Morrhuæ Non-Destearinatum

Ol. Morrh. Non-Destearin.

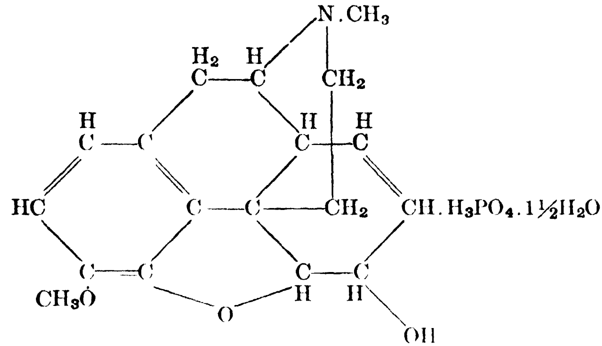
Non-destearinated Cod Liver Oil is the entire fixed oil obtained from fresh livers of *Gadus morrhua* Linné and other species of the Family *Gadidæ*, containing not more than 0.5 per cent by volume of water and liver tissue. Non-destearinated Cod Liver Oil contains in each Gm. not less than 850 U. S. P. Units of Vitamin A and not less than 85 U. S. P. Units of Vitamin D.

Description—Non-destearinated Cod Liver Oil is a thin, oily liquid at normal room temperature, and has a characteristic, slightly fishy, but not a rancid, odor, and a fishy taste. Non-destearinated Cod Liver Oil congeals or deposits stearin upon chilling.
Solubility—Non-destearinated Cod Liver Oil is slightly soluble in alcohol, but it is freely soluble in ether and in chloroform.
Water and sediment—Non-destearinated Cod Liver Oil contains not more than 0.5 per cent by volume of water and sediment, page 648.
Iodine value—The iodine value of Non-destearinated Cod Liver Oil is not less than 128 and not more than 180, page 647.
Other requirements—Non-destearinated Cod Liver Oil also satisfies the requirements of the tests for *Color*, *Unsaponifiable matter*, *Saponification value*, *Acid value*, and for *Spectrophotometric absorption value* under *Cod Liver Oil*, page 140.
Assay—Proceed as directed under *Cod Liver Oil*, page 718.
Packaging and storage—Preserve Non-destearinated Cod Liver Oil in tight containers. It may be stored in containers from which the air has been expelled by the production of a vacuum or by an inert gas.
Labeling—The Vitamin A potency and Vitamin D potency of Non-destearinated Cod Liver Oil, when designated on the label, shall be expressed in "United States Pharmacopœia Units" per gram of oil; these units may be referred to as "U. S. P. Units."

CODEINE PHOSPHATE

Codeinæ Phosphas

Codein. Phos.



$C_{18}H_{21}O_3N.H_3PO_4\ 1\frac{1}{2}H_2O$ Mol. wt. 424.38

Codeine Phosphate contains not less than 70 per cent of anhydrous codeine ($C_{18}H_{21}O_3N$).

Description—Codeine Phosphate occurs as fine, white, needle-shaped crystals or as a white, crystalline powder. It is odorless. It readily loses water of hydration on exposure to air and is affected by light. Its solution is acid to litmus paper.

Solubility—One Gm. of Codeine Phosphate dissolves in 2.5 cc. of water, and in 325 cc. of alcohol. One Gm. dissolves in 0.5 cc. of water at 80°, and in 125 cc. of boiling alcohol.

Identification—

A: Sulfuric acid containing 5 mg. of selenous acid in each cc. produces with Codeine Phosphate a green color, which rapidly changes to blue, then slowly back to green.

B: Dissolve about 10 mg. of Codeine Phosphate in 5 cc. of sulfuric acid, add a drop of ferric chloride T.S., and warm the mixture: the solution becomes blue, but changes to red on the addition of a drop of nitric acid.

C: A solution of Codeine Phosphate neutralized with ammonia T.S., and treated with silver nitrate T.S. produces a yellow precipitate which is soluble in diluted nitric acid and in ammonia T.S.

Chloride—A 10-cc. portion of a solution of Codeine Phosphate (1 in 100) shows no opalescence on the addition of a few drops of silver nitrate T.S. and 2 drops of nitric acid.

Sulfate—A 10-cc. portion of a solution of Codeine Phosphate (1 in 100) shows no turbidity at once on the addition of a few drops of barium chloride T.S.

Morphine—Dissolve about 50 mg. of potassium ferricyanide in 10 cc. of water, and add 1 drop of ferric chloride T.S. and 1 cc. of a solution of Codeine Phosphate (1 in 100): no blue color is produced at once.

Assay—Dissolve about 500 mg. of Codeine Phosphate, accurately weighed, in 10 cc. of water in a separator, add 10 cc. of sodium hydroxide T.S., and extract the codeine with four successive portions of 15 cc., 10 cc., 10 cc., and 5 cc. of chloroform, or a sufficient quantity to complete the extraction. Shake the combined chloroform solutions with 5 cc. of water, and completely separate the chloroform from the water layer. Evaporate the chloroform solution almost to dryness on a water bath, dissolve the residue by warming it with 15 cc. of tenth-normal sulfuric acid,

heat the solution on a water bath until it no longer has a perceptible odor of chloroform, cool, dilute with about 10 cc. of water, and titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 29.94 mg. of $C_{18}H_{21}O_3N$.

Packaging and storage—Preserve Codeine Phosphate in tight, light-resistant containers.

AVERAGE DOSE—**30 mg.** (approximately ½ grain).

Codeine Phosphate Tablets

CODEINE PHOSPHATE TABLETS

Tabellæ Codeinæ Phosphatis

Tab. Codein. Phos.

Codeine Phosphate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $C_{18}H_{21}O_3N.H_3PO_4.1\frac{1}{2}H_2O$.

Identification—

A: Digest a quantity of finely powdered Codeine Phosphate Tablets, equivalent to about 50 mg. of codeine phosphate, with 15 cc. of water and 5 cc. of diluted sulfuric acid for 1 hour. Filter, if necessary, and wash any undissolved residue with a few cc. of water. Render the filtrate alkaline with ammonia T.S., extract with several small portions of chloroform, and evaporate the chloroform solution to dryness on a steam bath. The resulting residue of codeine responds to *Identification tests A* and *B* under *Codeine Phosphate*, page 662.

B: Prepare about 10 cc. of a filtered solution of Codeine Phosphate Tablets (1 in 75). Neutralize 5 cc. of the solution with dilute ammonia T.S., and add silver nitrate T.S.: a yellow precipitate of silver phosphate is produced which is soluble in diluted nitric acid and in ammonia T.S.

Morphine—A 1-cc. portion of the solution from the preceding test meets the requirements of the test for *Morphine* described under *Codeine Phosphate*, page 143.

Assay—Weigh a counted number of not less than 20 Codeine Phosphate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 150 mg. of codeine phosphate, and transfer it completely to a 100-cc. volumetric flask. Add sufficient water to make a thin suspension, then add 20 cc. of half-normal sulfuric acid, shake the mixture occasionally during 2 hours, and allow it to stand over night. Add water to the 100-cc. mark, mix well, and filter through a filtering crucible. Transfer to a separator an accurately measured portion of the filtrate, equivalent to not less than 75 mg. of codeine phosphate, render the solution alkaline with ammonia T.S., and completely extract the alkaloid with small, successive portions of chloroform. Evaporate the combined chloroform solution nearly to dryness on a steam bath, add exactly 30 cc. of fiftieth-normal sulfuric acid, and heat gently to dissolve the codeine and expel all of the chloroform. Cool, and titrate the excess of acid with fiftieth-normal

sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 8.488 mg. of $C_{18}H_{21}O_3N.H_3PO_4.1\frac{1}{2}H_2O$.

Packaging and storage Preserve Codeine Phosphate Tablets in well-closed containers.

Sizes—Codeine Phosphate Tablets usually available contain the following amounts of codeine phosphate: 15, 30, and 60 mg. (¼, ½ and 1 grain).

AVERAGE DOSE OF CODEINE PHOSPHATE—**30 mg.** (approximately ½ grain).

Codeine Sulfate

CODEINE SULFATE

Codeinæ Sulfas

Codein. Sulf.

$(C_{18}H_{21}O_3N)_2\ H_2SO_4\ 5H_2O$ Mol. wt. 786.87

Description—Codeine Sulfate occurs as white crystals, usually needle-like, or as a white, crystalline powder. It effloresces in dry air and is affected by light.

Solubility—One Gm. of Codeine Sulfate dissolves in 30 cc. of water and in 1280 cc. of alcohol. One Gm. dissolves in 6.5 cc. of water at 80°. It is insoluble in chloroform and in ether.

Identification—

A: Sulfuric acid containing 5 mg. of selenous acid in each cc. produces with Codeine Sulfate a green color, which changes rapidly to blue, then slowly back to green.

B: Dissolve about 10 mg. of Codeine Sulfate in 5 cc. of sulfuric acid, add 1 drop of ferric chloride T.S., and warm the mixture: the solution becomes blue, but changes to red on the addition of 1 drop of nitric acid.

C: Codeine Sulfate responds to the test for *Sulfate*, page 663.

Free acid—A solution of 500 mg. of Codeine Sulfate in 15 cc. of water requires not more than 0.3 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried to constant weight at 100°, Codeine Sulfate loses not more than 12 per cent of its weight.

Residue on ignition—The residue on ignition from 500 mg. of Codeine Sulfate is negligible, page 685.

Readily carbonizable substances—Dissolve 10 mg. of Codeine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid S, page 680.

Morphine—Dissolve about 50 mg. of potassium ferricyanide in 10 cc. of water, and add 1 drop of ferric chloride T.S. and 1 cc. of a solution of Codeine Sulfate (1 in 100): no blue color is produced at once in the solution.

Packaging and storage—Preserve Codeine Sulfate in tight, light-resistant containers.

AVERAGE DOSE—**30 mg.** (approximately ½ grain).

Codeine Sulfate Tablets

CODEINE SULFATE TABLETS

Tabellæ Codeinæ Sulfatis

Tab. Codein. Sulf.

Codeine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $(C_{18}H_{21}O_3N)_2.H_2SO_4.5H_2O$.

Identification—

A: The residue of codeine obtained as directed in *Identification test A* under *Codeine Phosphate Tablets*, page 144, responds to *Identification tests A* and *B* under *Codeine Sulfate*, page 145.

B: A filtered solution of Codeine Sulfate Tablets responds to the tests for *Sulfate*, page 663.

Morphine—A 1-cc. portion of a solution (1 in 100) of the codeine obtained in *Identification test A*, made with the aid of a few drops of sulfuric acid, meets the requirements of the test for *Morphine* under *Codeine Sulfate*, page 145.

Assay—Proceed as directed under the *Assay* for *Codeine Phosphate Tablets*, page 144. Each cc. of fiftieth-normal sulfuric acid is equivalent to 7.869 mg. of $(C_{18}H_{21}O_3N)_2.H_2SO_4.5H_2O$.

Packaging and storage—Preserve Codeine Sulfate Tablets in well-closed containers.

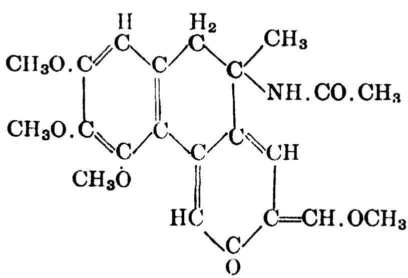
Sizes—Codeine Sulfate Tablets usually available contain the following amounts of codeine sulfate: 15, 30, and 60 mg. (¼, ½, and 1 grain).

AVERAGE DOSE OF CODEINE SULFATE—**30 mg.** (approximately ½ grain).

Colchicine

COLCHICINE

Colchicina



$C_{22}H_{25}NO_6$ Mol. wt. 399.43

Colchicine is an alkaloid obtained from *Colchicum autumnale* Linné (Fam. *Liliaceæ*).

Caution—Colchicine is extremely poisonous.

Description—Colchicine occurs as pale yellow, amorphous scales, or powder. It is odorless or nearly so, and darkens on exposure to light. A solution of Colchicine is lævorotatory.

Solubility—One Gm. of Colchicine dissolves in 25 cc. of water, and in about 220 cc. of ether. It is freely soluble in alcohol and in chloroform.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Colchicine, determined in a solution containing in each 100 cc. 1.0 Gm. of Colchicine, previously dried at 100° for 3 hours, and using a 200 mm. tube, is not less than −410° and not more than −435°.

Identification—

A: Mix about 1 mg. of Colchicine with a few drops of sulfuric acid: a lemon yellow color is produced in the mixture, but on the addition of a drop of nitric acid the color changes to greenish blue, rapidly becoming reddish and finally yellow, or almost colorless. Upon now adding an excess of sodium hydroxide T.S., the color is changed to red.

B: One drop of ferric chloride T.S., added to 1 cc. of an alcohol solution of Colchicine (1 in 20), produces a garnet red color at once.

Loss on drying—Dry about 500 mg. of Colchicine, accurately weighed, at 100° for 3 hours: the loss in weight is not more than 3 per cent.

Residue on ignition—The residue on ignition from 100 mg. of Colchicine is negligible, page 685.

Chloroform Heat a mixture of about 10 mg. of Colchicine, 2 cc. of sodium hydroxide T.S., and 1 drop of aniline: no odor of phenyl isocyanide is developed.

Colchiceine—The addition of 2 drops of ferric chloride T.S. to 5 cc. of a solution of Colchicine (1 in 100) produces no color. On heating the mixture, a brownish red color develops, which changes to brownish black.

Packaging and storage—Preserve Colchicine in tight, light-resistant containers.

AVERAGE DOSE—**0.5 mg.** (approximately 1/120 grain).

Colchicine Tablets

COLCHICINE TABLETS

Tabellæ Colchicinæ

Tab. Colchicin.

Colchicine Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{22}H_{25}NO_6$.

Identification—The colchicine obtained in the assay melts at about 140° and responds to the *Identification tests* under *Colchicine*, page 146.

Assay—Weigh a counted number of not less than 20 Colchicine Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 50 mg. of colchicine, macerate it in a flask with 10 cc. of petroleum benzin for 5 minutes, and decant the liquid through a small filter paper, retaining as much as possible of the powder in the flask. Repeat the maceration three times with 10-cc. portions of petroleum benzin in the manner just described. Discard the benzin extracts. Now add to the flask 20 cc. of alcohol, and heat gently on a steam bath under a reflux condenser for 10 minutes. Decant the alcohol solution through the same filter as used with the petroleum benzin, and repeat the extraction with another portion of 20 cc. of alcohol in the same manner. Transfer the residue to the filter with the aid of hot alcohol, and wash the flask and the filter with small portions of hot alcohol until the washings are colorless. Evaporate the combined alcohol extract to dryness on a steam bath, add to the residue 15 cc. of chloroform, and heat gently until no more dissolves Filter into a tared flask, wash the beaker and filter with chloroform until the wash-

ings are colorless, and carefully evaporate the chloroform to dryness on a steam bath. Add to the residue 2 cc. of alcohol, and evaporate to dryness on a steam bath. Re-evaporate with 2 cc. of alcohol, and dry the colchicine to constant weight at 100°.

Packaging and storage—Preserve Colchicine Tablets in well-closed containers.

Sizes—*Colchicine Tablets usually available contain the following amount of colchicine: 0.5 mg. (1/120 grain).*

AVERAGE DOSE OF COLCHICINE—**0.5 mg.** (*approximately 1/120 grain*).

Collodion

COLLODION

Collodium

Collod.

Collodion contains not less than 5 per cent of pyroxylin.

PYROXYLIN	40 Gm.
ETHYL OXIDE	750 cc.
ALCOHOL	250 cc.
To make about	1000 cc.

Add the alcohol to the pyroxylin contained in a suitable bottle, shake the mixture thoroughly, add the ethyl oxide, and again shake the mixture until the pyroxylin is dissolved. Stopper the bottle well, and set it aside until the liquid becomes clear. Finally decant the clear portion from any sediment which may have deposited, and promptly transfer it to tight containers.

Caution—It is highly inflammable.

Description—Collodion is a clear, or slightly opalescent, syrupy liquid. It is colorless, or slightly yellowish, and has the odor of ether.

Specific gravity—The specific gravity of Collodion is not less than 0.765 and not more than 0.775.

Identification—

A: When exposed to air in a thin layer, Collodion leaves a transparent, tenacious film. The film of pyroxylin so obtained burns rapidly, with a yellow flame.

B: When mixed with an equal volume of water, Collodion yields a viscid, stringy mass of pyroxylin.

Free acid—Add 5 cc. of Collodion to 5 cc. of water: the liquid separated from the pyroxylin is not acid to litmus.

Assay—Pour quickly about 10 cc. of Collodion into a tared flask, stopper, weigh accurately, warm it on a water bath, and add 10 cc. of water dropwise, with constant stirring. Evaporate the mixture on a water bath, and dry the residue to constant weight at 110°.

Alcohol content—From 22 to 26 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Collodion in tight containers, at a temperature not above 30°, remote from fire.

FLEXIBLE COLLODION

Collodium Flexile

Collod. Flex.

CAMPHOR	20 Gm.
CASTOR OIL	30 Gm.
COLLODION, a sufficient quantity,	
To make	1000 Gm.

Weigh the ingredients, successively, into a dry, tared bottle, stopper the bottle, and shake the mixture until the camphor is dissolved.

Alcohol content—From 21 to 25 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Flexible Collodion in tight containers, at a temperature not above 30°, remote from fire.

CORIANDER OIL

Oleum Coriandri

Ol. Coriand.

Coriander Oil is the volatile oil distilled with steam from the dried ripe fruit of *Coriandrum sativum* Linné (Fam. *Umbelliferæ*).

Description—Coriander Oil is a colorless or pale yellow liquid, having the characteristic odor and taste of coriander.
Solubility—Coriander Oil is soluble in 3 volumes of 70 per cent alcohol.
Specific gravity—The specific gravity of Coriander Oil is not less than 0.863 and not more than 0.875.
Optical rotation—The optical rotation of Coriander Oil is not less than +8° and not more than +15° in a 100-mm. tube, page 675.
Refractive index—The refractive index of Coriander Oil is not less than 1.4620 and not more than 1.4720 at 20°, page 682.

Heavy metals—Coriander Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 658.
Packaging and storage—Preserve Coriander Oil in well-filled, tight containers and avoid exposure to excessive heat.

Corn Oil

CORN OIL

Oleum Maydis

Ol. Mayd.

The refined fixed oil expressed from the embryo of *Zea Mays* Linné (Fam. *Gramineæ*).

Description—Corn Oil is a clear, light yellow, oily liquid. It has a faint, characteristic odor and taste.
Solubility—Corn Oil is slightly soluble in alcohol. It is miscible with ether, chloroform, benzene, and petroleum benzin.
Specific gravity—The specific gravity of Corn Oil is not less than 0.914 and not greater than 0.921.
Cottonseed oil—Mix 5 cc. of Corn Oil in a test tube with 5 cc. of a mixture of equal volumes of amyl alcohol and a solution of sulfur in carbon disulfide (1 in 100). Warm the mixture gently until the carbon disulfide is expelled, then immerse the tube to one-third of its depth in a boiling, saturated solution of sodium chloride: no reddish color develops within 15 minutes.
Free fatty acids—The free acids in 10 Gm. of Corn Oil require for neutralization not more than 2 cc. of tenth-normal sodium hydroxide, page 616.
Iodine value—The iodine value of Corn Oil is not less than 112 and not more than 128, page 647.
Saponification value—The saponification value of Corn Oil is not less than 188 and not more than 193, page 647.
Unsaponifiable matter—The unsaponifiable matter in Corn Oil is not more than 2 per cent, page 648.
Packaging and storage—Preserve Corn Oil in tight containers, and avoid exposure to excessive heat.

Cotton, Purified

PURIFIED COTTON

Gossypium Purificatum

Gossyp. Purif.—Absorbent Cotton

Purified Cotton is the hair of the seed of cultivated varieties of *Gossypium hirsutum* Linné, or of other species of *Gossypium* (Fam. *Malvaceæ*), freed from adhering impurities, deprived of fatty matter, bleached, and sterilized.

All Purified Cotton shall be conditioned for at least 4 hours in a standard atmosphere of 65 per cent ±2 per cent relative humidity at 21° ±1.1° (70°F. ±2°F.), before performing any of the tests directed below, and the net weight of the Cotton shall be determined under these conditions. The Cotton must be removed from its wrappings before being placed in the conditioning atmosphere.

Description—White, soft, fine filament-like hairs appearing under the microscope as hollow, flattened, and twisted bands, striate and slightly thickened at the edges. It is nearly odorless and almost tasteless.

Solubility—Purified cotton is insoluble in ordinary solvents, but is soluble in ammoniated cupric oxide T.S.

Residue on ignition—Place about 5 Gm. of Purified Cotton, accurately weighed, in a porcelain or platinum dish, and moisten with diluted sulfuric acid. Gently heat the cotton until it is charred, then ignite more strongly until the carbon is completely consumed: the weight of the residue corresponds to not more than 0.2 per cent of the weight of the Cotton.

Alkali or acid—Thoroughly saturate about 10 Gm. of Purified Cotton with 100 cc. of recently boiled and cooled water, then with the aid of a glass rod press out two 25-cc. portions of the water into white porcelain dishes. Add to one portion 3 drops of phenolphthalein T.S. and to the other portion 1 drop of methyl orange T.S.: no pink color develops in either portion.

Water-soluble substances—Place 10 Gm. of Purified Cotton, accurately weighed, in a beaker containing 1000 cc. of water, and boil gently for 30 minutes, adding water as required to maintain the volume. Pour the water through a funnel into another vessel, and press out the excess water from the cotton with a glass rod. Wash the cotton in the funnel with two 250-cc. portions of boiling water, pressing the cotton after each washing. Filter the combined extract and washings, washing the filter thoroughly with hot water. Evaporate the combined extract and washings to a small volume, transfer to a tared porcelain or platinum dish, evaporate to dryness, and dry the residue to constant weight at 105°: the residue weighs not more than 25 mg.

Fatty matter—Pack 10 Gm., ±10 mg., of Purified Cotton in a Soxhlet extractor, and extract with ether, adjusting the temperature so that the ether will siphon over not less than 4 times per hour into the tared flask of the extraction apparatus, and continue the extraction for 5 hours. The ether solution in the flask shows no trace of blue, green, or brownish color. Evaporate the extract to dryness, and dry for 1 hour at 105°: the weight of the residue does not exceed 70 mg.

Dyes—Pack about 10 Gm. of Purified Cotton in a narrow percolator, and extract slowly with alcohol until the percolate measures 50 cc.: when observed downward through a column 20 cm. in depth, the percolate may show a yellowish color, but neither a blue nor a green tint.

Fiber length—Determine the fiber length of Purified Cotton, as directed under *Fiber Length of Cotton*, page 619: not less than 60 per cent, by weight, of the fibers shall be 12.5 mm. (about ½ inch) or greater in length, and not more than 10 per cent, by weight, of the fibers shall be 6.25 mm. (about ¼ inch) or less in length.

Absorbency—Proceed as directed under *Absorbency of Purified Cotton*, page 614: submersion is complete in 10 seconds at a temperature of 25°, and the cotton retains not less than 24 times its weight of water.

Sterility—Purified Cotton meets the requirements of the *Sterility Tests for Solids*, page 689.

Packaging and storage—Package Purified Cotton in rolls of not more than 454 Gm. (1 pound) of a continuous lap, with a light-weight paper running under the entire lap, the paper being of such width that it may be folded over the edges of the lap to a distance of at least 25 mm. (1 inch), the two together being tightly and evenly rolled, and enclosed and sealed in a second well-closed container. Purified Cotton may also be packaged in other types of containers if these are so constructed that the sterility of the product is maintained. Sterilize Purified Cotton in the sealed container.

Labeling—The label of Purified Cotton bears a statement to the effect that the sterility of the Cotton cannot be guaranteed if the package bears evidence of damage or if the package has been opened previously.

Cottonseed Oil

COTTONSEED OIL

Oleum Gossypii Seminis

Ol. Gossyp. Sem.

Cottonseed Oil is the refined fixed oil obtained from the seed of cultivated plants of various varieties of *Gossypium hirsutum* Linné or of other species of *Gossypium* (Fam. *Malvaceæ*).

Description—Cottonseed Oil is a pale yellow, oily liquid. It is odorless or nearly so and has a bland taste. At temperatures below 12° particles of solid fat separate from the Oil, and at about 0° to −5° the Oil becomes solid or nearly so.

Solubility—Cottonseed Oil is slightly soluble in alcohol. It is miscible with ether, chloroform, petroleum benzin, and with carbon disulfide.

Specific gravity—The specific gravity of Cottonseed Oil is not less than 0.915 and not more than 0.921.

Identification—

A: Dilute Cottonseed Oil with an equal volume of carbon disulfide, and add sulfuric acid (specific gravity 1.6 to 1.7): the mixture rapidly becomes reddish brown in color.

B: Mix 2 cc. of Cottonseed Oil in a test tube with 2 cc. of a mixture of equal volumes of amyl alcohol and a solution of sulfur in carbon disulfide (1 in 100). Warm the mixture carefully until the carbon disulfide is expelled, and immerse the test tube to one-third of its length in a boiling, saturated solution of sodium chloride: a red color develops in the mixture within 5 to 15 minutes.

Iodine value—The iodine value of Cottonseed Oil is not less than 105 and not more than 114, page 647.

Saponification value—The saponification value of Cottonseed Oil is not less than 190 and not more than 198, page 647.

Solidification temperature of the fatty acids—The dry, mixed fatty acids of Cottonseed Oil solidify at a temperature not below 28° and not above 35°, page 646.

Packaging and storage—Preserve Cottonseed Oil in tight containers.

Cresol

CRESOL

Cresol

C_7H_8O $CH_3.C_6H_4.OH$ Mol. wt. 108.13

Cresol is a mixture of isomeric cresols obtained from coal tar.

Description—Cresol is a colorless, or yellowish to brownish yellow, or pinkish, highly refractive liquid, becoming darker with age and on exposure to light. It has a

phenol-like, sometimes empyreumatic odor. A saturated solution of Cresol is neutral or only slightly acid to litmus paper.

Solubility—One cc. of Cresol dissolves in about 50 cc. of water, usually forming a cloudy solution. It is miscible with alcohol, with ether, and with glycerin, and is dissolved by solutions of the fixed alkali hydroxides.

Specific gravity—The specific gravity of Cresol is not less than 1.030 and not more than 1.038.

Distillation range—Not less than 90 per cent by volume of Cresol distils between 195° and 205°, when determined by Method II under *Boiling or Distilling Temperatures*, page 624.

Identification—A saturated solution of Cresol becomes bluish violet on the addition of ferric chloride T.S.

Hydrocarbons—A solution of 1 cc. of Cresol in 60 cc. of water shows no more turbidity than that produced in 58 cc. of water by the addition of 1.5 cc. of fiftieth-normal sulfuric acid and 1 cc. of barium chloride T.S., comparison being made after the control mixture has been well shaken and allowed to stand for 5 minutes.

Packaging and storage—Preserve Cresol in tight, light-resistant containers.

Cresol Solution, Saponated

SAPONATED CRESOL SOLUTION

Liquor Cresolis Saponatus

Liq. Cresol. Sap.—Compound Cresol Solution

Saponated Cresol Solution contains, in each 100 cc., not less than 46 cc. and not more than 52 cc. of cresol. It is prepared by the saponification of a mixture of cresol with vegetable oils, or the mixed fatty acids derived therefrom, excluding coconut and palm kernel oils. The vegetable oil may be corn, cottonseed, linseed, or soya bean, or similar oils which have a saponification value, page 647, not greater than 205, and an iodine value, page 647, not less than 100.

Saponated Cresol Solution may be prepared extemporaneously in the following manner.

Cresol	500 cc.
The Vegetable Oil	350 cc.
Alcohol	55 cc.
Potassium Hydroxide	73 Gm.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Mix the vegetable oil and the alcohol. Dissolve the potassium hydroxide in 100 cc. of distilled water and immediately add the hot solution to the oil while vigorously stirring the mixture with a mechanical

stirrer. Continue the stirring until a small portion of the soap dissolves in hot distilled water to form a clear solution. Add the cresol to the soap, stir until a clear solution is obtained, and add sufficient distilled water to make the Solution measure 1000 cc.

NOTE—If desired, 58 Gm. of the potassium hydroxide may be replaced by 37 Gm. of sodium hydroxide. It is also permissible to omit the alcohol, in which case the oil should be warmed to 85° before the addition of the solution of the alkali hydroxide, and the mixture heated, if necessary, to complete saponification.

The quantities of potassium hydroxide and sodium hydroxide here directed have been determined upon the basis of the official minimum percentages of strength, namely, 85 per cent and 95 per cent, respectively. If either or both of the hydroxides used should have a different percentage of strength, corresponding alterations in the quantities should be made.

Characteristics of the liberated fatty acids—Place 50 cc. of Saponated Cresol Solution in a 1500-cc. round-bottom flask, and add 100 cc. of water and 30 cc. of diluted sulfuric acid. Connect the flask with a source of steam and a condenser and distil briskly with steam until 3 cc. of distillate produces not more than a faint opalescence upon the addition of 1 cc. of bromine T.S. Transfer the residual liquid to a separator, cool to room temperature, add 50 cc. of ether, shake well, and allow the layers to separate. Draw off the water layer as completely as possible and wash the ether layer three times with 50-cc. portions of cold water, rejecting the washings Transfer the ether layer to a small flask, containing 15 Gm. of anhydrous sodium sulfate, shake well, and decant the ether solution through a dry filter into a dry beaker. Carefully evaporate the ether and dry the mixed fatty acids at 105° for 1 hour. The acid value of the fatty acids is not more than 205, using about 1 Gm. of the fatty acids, accurately weighed, page 646, and the iodine value of the fatty acids is not less than 95, using from 150 to 250 mg. of the fatty acids, accurately weighed, page 647.

Assay—Mix in a 500-cc. distilling flask 50 cc. of Saponated Cresol Solution, accurately measured at 25°, with 150 cc. of purified kerosene. Add 3 Gm. of sodium bicarbonate, and distil the mixture, using an upright condenser, at the rate of not more than 2 drops per second, until the distillate comes over strongly yellow, receiving the distillate in a 250-cc. to 300-cc. separator. Draw off the lower water layer, shake the kerosene layer with 10 cc. of sulfuric acid (49 to 51 per cent by weight), allow to stand for 2 hours, then draw off the acid layer completely, and discard it. Add to the kerosene layer 40 cc. of a 15 per cent solution of sodium hydroxide, accurately measured at 25°, shake well for 5 minutes, then allow to stand until complete separation has taken place, and draw off the sodium hydroxide layer into a graduated cylinder. Shake the kerosene layer again with a fresh portion of 20 cc. of the 15 per cent sodium hydroxide solution, accurately measured at 25°, allow the two layers to separate completely, and draw off the sodium hydroxide layer into the graduated cylinder. Adjust the sodium hydroxide solution in the graduated cylinder to a temperature of 25°, and note its volume. The difference between the volume noted and the total volume of sodium hydroxide solution used represents the volume of cresol present in 50 cc. of Saponated Cresol Solution. This difference is not less than 23 cc. and not more than 26 cc.

Transfer the sodium hydroxide solution of the cresol obtained in the assay to a separator, and add sufficient hydrochloric acid to render the solution distinctly acid. Allow the liberated cresol to separate completely, and draw off the lower water layer. Wash the cresol with several successive portions of 20 cc. each of a saturated

solution of calcium chloride until the washings are neutral or only slightly acid. Then add to the washed cresol about 5 Gm. of coarsely granular (about a No. 4 mesh) anhydrous calcium chloride, shake gently at frequent intervals during 3 hours, and allow to stand over night. Decant the clear liquid completely into a graduated 25-cc. cylinder and note its volume. Transfer the dehydrated cresol to a 50- to 60-cc. distilling flask, and distil as directed by Method II under *Boiling or Distilling Temperatures*, page 624, at the rate of about 1.5 cc. per minute, receiving the distillate in the cylinder in which the cresol was measured. At least 90 per cent of the volume of cresol taken distils between 195° and 205°.

Packaging and storage—Preserve Saponated Cresol Solution in tight containers.

Alcohol content—Not more than 5 per cent, by volume, of C_2H_5OH.

CUPRIC CITRATE

Cupri Citras

Cupr. Cit.—Copper Citrate

$Cu_2C_6H_4O_7.2\frac{1}{2}H_2O$ Mol. wt. 360.27

Cupric Citrate contains not less than 34 per cent and not more than 37 per cent of Cu, corresponding to not less than 96.3 per cent of $Cu_2C_6H_4O_7.2\frac{1}{2}H_2O$.

Description—Cupric Citrate occurs as a green or bluish-green, finely crystalline, odorless powder.

Solubility—Cupric Citrate is slightly soluble in water; somewhat more soluble in a solution of an alkali citrate, forming a greenish-blue solution.

Identification—

A: When dissolved in ammonia T.S., Cupric Citrate yields an intense blue solution.

B: Dissolve about 1 Gm. of Cupric Citrate in 20 cc. of diluted hydrochloric acid and dilute to 200 cc. with hot water. Saturate the solution with hydrogen sulfide, filter, and evaporate the filtrate to dryness on a steam bath: the residue responds to the test for *Citrate*, page 660.

Acetate—Dissolve 500 mg. of Cupric Citrate in 10 cc. of diluted sulfuric acid, and heat to boiling: no odor of acetic acid is emitted during the heating.

Carbonate—Dissolve 500 mg. of Cupric Citrate in 10 cc. of diluted nitric acid: no effervescence occurs.

Chloride—Dissolve 500 mg. of Cupric Citrate in 20 cc. of diluted nitric acid and divide into two equal portions. To one portion add 1 cc. of silver nitrate T.S., allow to stand for 10 minutes, filter until the filtrate is clear, add to the filtrate 1 cc. of fiftieth-normal hydrochloric acid, and dilute with water to 20 cc. Use this as a control. To the other portion add 1 cc. of silver nitrate T.S. and dilute with water to 20 cc. Any resulting turbidity is not greater than in the control.

Nitrate—Add 2 Gm. of Cupric Citrate to 20 cc. of water, add sulfuric acid until solution is complete, and divide it into two equal portions. Add a few mg. of sodium chloride and 10 cc. of sulfuric acid to one portion and set it aside as a blank. Add a few mg. of sodium chloride and 3 drops of a mixture of equal volumes of indigo carmine T.S. and water to the other half of the solution, and, while keeping the

solution cool in ice and water, add 10 cc. of sulfuric acid: after 5 minutes the color of the indigo is still apparent when compared with the blank.

Sulfate—Heat 2 Gm. of Cupric Citrate with 20 cc. of water and add hydrochloric acid in small portions until the cupric citrate has dissolved, then add an excess of 1 cc. of the acid. Dilute the solution with water to about 75 cc. and filter if necessary. Heat the filtrate to boiling, add in small portions, 5 cc. of barium chloride T.S., and digest the mixture on a steam bath for 3 hours. If a precipitate is present, collect it on a filter or Gooch crucible, wash with hot water until the washings are free from chloride, dry, ignite, and weigh. The weight of the precipitate of barium sulfate is not more than 25 mg.

Assay—Dissolve about 700 mg. of Cupric Citrate, accurately weighed, in 10 cc. of diluted hydrochloric acid in a glass-stoppered flask, dilute with 50 cc. of water, and add 3 Gm. of potassium iodide. Allow to stand for 5 minutes. Titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Perform a blank test with the same quantities of the same reagents and in the same manner and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 6.357 mg. of Cu.

Packaging and storage—Preserve Cupric Citrate in tight containers.

Cupric Citrate Ointment

CUPRIC CITRATE OINTMENT

Unguentum Cupri Citratis

Ung. Cupr. Cit.—Copper Citrate Ointment

Cupric Citrate Ointment contains not less than 7.2 per cent and not more than 8.8 per cent of $Cu_2C_6H_4O_7.2\frac{1}{2}H_2O$.

Cupric Citrate	80 Gm.
Wool Fat	210 Gm.
Light Liquid Petrolatum	210 Gm.
White Petrolatum	500 Gm.
To make	1000 Gm.

Reduce the cupric citrate to a very fine powder, levigate it with the wool fat, then incorporate the white petrolatum, previously melted and mixed with the light liquid petrolatum, and stir until the mixture congeals.

Assay—Weigh accurately about 5 Gm. of Cupric Citrate Ointment, transfer it to a beaker with the aid of about 25 cc. of a mixture of equal volumes of chloroform and

ether. Stir well for a few minutes, allow to settle, and decant the liquid through a paper filter, retaining in the beaker as much of the insoluble residue as possible. Stir the residue with about 15 cc. of the chloroform-ether mixture, then transfer it, with the aid of some of the same solvent, to the filter, and wash the beaker and the filter with small portions of the solvent. Dry the residue with the filter at about 100° for 30 minutes, then place in a porcelain crucible, and ignite, slowly at first, then gradually increasing the temperature until most of the carbon has burned off. Transfer the residue, as completely as possible, to a beaker, add to the crucible 10 cc. of diluted nitric acid (1 in 2), and heat for a few minutes. Then add the acid to the residue in the beaker, and heat on a steam bath until no more of the residue dissolves. Add 5 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Dissolve the residue in 25 cc. of water, filter into a glass-stoppered flask, and wash with about 25 cc. of water. Add to the flask 3 Gm. of potassium iodide, stopper, allow to stand for 5 minutes, then titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 18.014 mg. of $Cu_2C_6H_4O_7.2\frac{1}{2}H_2O$.

CUPRIC SULFATE

Cupri Sulfas

Cupr. Sulf.—Copper Sulfate

$CuSO_4.5H_2O$ Mol. wt. 249.71

Cupric Sulfate contains not less than 63 per cent and not more than 66.8 per cent of $CuSO_4$, corresponding to not less than 98.5 per cent of the hydrated salt ($CuSO_4.5H_2O$).

Description—Cupric Sulfate occurs as deep blue, triclinic crystals, or as blue, crystalline granules or powder. It has a nauseous, metallic taste and effloresces slowly in dry air. Its solutions are acid to litmus paper.

Solubility—One Gm. of Cupric Sulfate dissolves in 3 cc. of water, in about 500 cc. of alcohol, and very slowly in 3 cc. of glycerin. One Gm. dissolves in about 0.5 cc. of boiling water.

Identification—

A: A solution of Cupric Sulfate (1 in 20) has a blue color.

B: A solution of Cupric Sulfate (1 in 10) responds to the tests for *Copper*, page 660, and for *Sulfate*, page 663.

Alkali and earths—Dissolve 2 Gm. of Cupric Sulfate in 100 cc. of water, add 1 cc. of diluted hydrochloric acid, and pass hydrogen sulfide through the solution until all of the copper is precipitated. Filter the mixture, evaporate 50 cc. of the filtrate to dryness, and ignite: the weight of the residue does not exceed 3 mg.

Assay—Weigh accurately about 1 Gm. of Cupric Sulfate, dissolve it in 50 cc. of water, add 4 cc. of acetic acid and 3 Gm. of potassium iodide, and titrate the liberated

iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 15.96 mg. of $CuSO_4$.

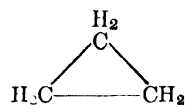
Packaging and storage—Preserve Cupric Sulfate in tight containers.

Cyclopropane

CYCLOPROPANE

Cyclopropanum

Cycloprop.—Trimethylene



C_3H_6 Mol. wt. 42.08

Cyclopropane contains not less than 99 per cent by volume of C_3H_6.

Description—Cyclopropane is a colorless gas of characteristic odor resembling that of petroleum benzin, and having a pungent taste. One liter of Cyclopropane at a pressure of 760 mm. and a temperature of 0° weighs 1.879 Gm.

Solubility—One volume of Cyclopropane dissolves in about 2.7 volumes of water at 15°. It is freely soluble in alcohol, and soluble in fixed oils.

Note—Cylinders containing Cyclopropane must be kept at a temperature of 25° ± 2° for at least 6 hours before the Cyclopropane is withdrawn for the following determinations. Samples for the following tests and assays are to be corrected to a pressure of 760 mm. and a temperature of 25°.

Acids or alkalies—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of 3 color-comparator tubes of clear glass, of approximately the same size and marked "A," "B," and "C," respectively. To tube "B" add 0.2 cc. of hundredth-normal hydrochloric acid and to tube "C" add 0.4 cc. of hundredth-normal hydrochloric acid. Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Cyclopropane through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that in tube "C" and no deeper yellow than that in tube "A."

Carbon dioxide—Pass 1000 cc. of Cyclopropane through 50 cc. of barium hydroxide T.S. (The test solution must be devoid of turbidity prior to the test.) Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of the gas. The delivery tube must have an orifice approximately 1 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the barium hydroxide solution. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with the 50 cc. of solution. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution, prepared by dissolving 100 mg. of sodium bicarbonate in 100 cc. of freshly boiled and cooled water, is added to another 50-cc. portion of barium hydroxide T.S. under the prescribed conditions.

Halogens—Provide a 500-cc. flask with a tightly-fitting two-hole rubber stopper. Through one of the holes pass a delivery tube bent at right angles and extending just beyond the lower surface of the stopper. Through the other opening insert a capillary tube bent at right angles and with a bore of 1 mm. ± 0.2 mm., in the same manner. Place in a 50-cc. cylinder, having an internal diameter of 2 cm. ± 0.25 cm., 40 cc. of sodium carbonate solution, containing 1 Gm. of monohydrated sodium carbonate in 1000 cc. of water. Provide the cylinder with a two-hole rubber stopper, and through one hole pass a right angle delivery tube, with a bore of 3 mm. ± 0.5 mm., to within 2 mm. of the bottom of the cylinder. The end of the delivery

tube which extends out of the cylinder is provided with an enlargement 8 cm. ± 0.5 cm. long and with an internal diameter of 2 cm. ± 0.25 cm. Through the other opening in the stopper pass another right-angle delivery tube, having it extend just below the surface of the stopper. Collect 500 cc. of Cyclopropane in the flask. By means of hydrostatic pressure, applied through the delivery tube, force the gas through the capillary tube, the water used being previously saturated with Cyclopropane. Ignite the gas, place the enlarged end of the delivery tube, connected with the cylinder, around the flame, extending the flame one-third of the way into the enlargement. Apply suction to the shorter delivery tube connected with the cylinder, thus drawing the spent gases through the sodium carbonate solution, the period of ignition of the 500 cc. of Cyclopropane requiring approximately 30 minutes. If the air employed for the ignition is not halogen-free, a correction must be made for the amount of halogen in the volume of air used for the ignition of the gas. Drain the sodium carbonate solution into a 500-cc. volumetric flask, and rinse the cylinder thoroughly, collecting the washings in the flask. Dilute the solution to volume, and mix thoroughly. Add sufficient nitric acid to 50 cc. of the solution to make it acid to litmus paper, and then add 1 cc. of acid in excess. Prepare a blank containing 0.5 cc. of thousandth-normal hydrochloric acid and 4 cc. of the sodium carbonate solution in 46 cc. of water, acidify with nitric acid, and then add 1 cc. of acid in excess. Add 1 cc. of silver nitrate T.S. to each solution. After 5 minutes any opalescence in the solution representing the Cyclopropane should not exceed that in the blank.

Propylene, allene and other unsaturated hydrocarbons—Pass 1000 cc. of Cyclopropane through exactly 50 cc. of hundredth-normal potassium permanganate contained in a 50-cc. cylinder and maintained at 3° ± 2°. Regulate the flow so as to require 15 minutes for the delivery of the gas. The delivery tube must have an orifice 1 mm. ± 0.2 mm. in diameter and must extend to within 2 mm. of the bottom of the vessel containing the potassium permanganate solution. The vessel employed must give a hydrostatic column of 12 to 14 cm. with 50 cc. of the solution. Immediately transfer the potassium permanganate solution in several portions to an Erlenmeyer flask of about 300-cc. capacity, containing a mixture of exactly 50 cc. of hundredth-normal oxalic acid and 5 cc. of sulfuric acid previously heated to 90°. After all of the potassium permanganate solution has been added, titrate the mixture with hundredth-normal potassium permanganate to a faint pink color which persists for 30 seconds. The volume of hundredth-normal potassium permanganate reduced by the gas does not exceed 10 cc.

Carbon monoxide—Transfer 250 cc. of Cyclopropane to a suitable container, and add, avoiding the admixture of air as much as possible, 2.5 cc. of diluted blood, prepared by adding 0.5 cc. of blood, page 748, to 10 cc. of water. Into a similar container pass 250 cc. of air collected at a place removed from sources of carbon monoxide, and add 2.5 cc. of the diluted blood. Stopper the containers securely, and agitate them for 15 minutes. Transfer the blood to two small test tubes, add to each 40 mg. of a mixture of equal weights of pyrogallol and tannic acid, shake thoroughly, and allow to stand in the dark for 15 minutes. Upon observation, the tube containing the blood exposed to the Cyclopropane shows no pink coloration and matches the gray color produced in the blank test.

Assay—Withdraw 100 cc. of Cyclopropane, accurately measured in a gas burette previously filled with mercury and equipped with a leveling bulb at the lower end, from a cylinder in the upright position. Connect one arm of the stopcock to a Hempel pipette which has been previously filled with sulfuric acid. Transfer the gas completely to the Hempel pipette through proper manipulation of the stopcock and the leveling bulb. Transfer any residual gas in the pipette to the burette, and read its volume accurately. Again transfer the residual gas to the Hempel pipette and return it a second time to the burette for measurement. Repeat this procedure until a constant volume is obtained. Not more than 1 cc. of gas remains.

Packaging and storage—Preserve Cyclopropane in tight containers.

Labeling—Label Cyclopropane with the following: *Caution—Cyclopropane is inflammable and its mixture with oxygen or air may explode when brought in contact with a flame or other causes of ignition.*

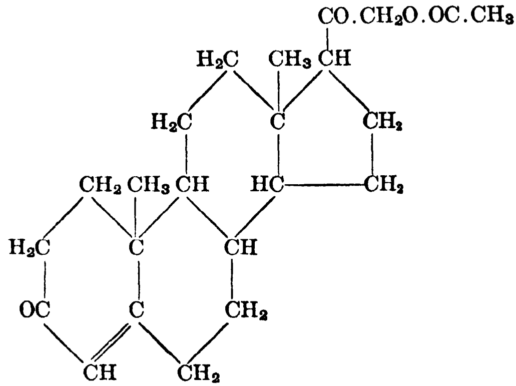
Dental Cones

Desoxycorticosterone Acetate

DESOXYCORTICOSTERONE ACETATE

Desoxycorticosteroni Acetas

Desoxycort. Acet.—Deoxycostone Acetate



$C_{23}H_{32}O_4$ Mol. wt. 372.49

Description—Desoxycorticosterone Acetate occurs as a white, crystalline powder. It is odorless and is stable in air.

Solubility—Desoxycorticosterone Acetate is practically insoluble in water. It is sparingly soluble in alcohol, in acetone, and in dioxane. It is slightly soluble in vegetable oils.

Melting range—Desoxycorticosterone Acetate melts between 154° and 160°, page 667.

Specific rotation—The specific rotation, $[\alpha]_D^{20}$, of Desoxycorticosterone Acetate, determined in a solution in dioxane containing, in each 10 cc., 100 mg. of Desoxycorticosterone Acetate and using a 100-mm. tube, is not less than +168° and not more than +176°, page 675.

Identification—

A: Dissolve 25 mg. of Desoxycorticosterone Acetate in 2.5 cc. of methanol, add 25 mg. of potassium bicarbonate dissolved in 0.7 cc. of water, and allow to stand at room temperature for 16 hours. Concentrate to a small volume by evaporation *in vacuo*, inoculate with a crystal of desoxycorticosterone, and let stand for several hours. The crystalline precipitate which is formed is filtered off by suction and washed with water. The precipitate is recrystallized from very little acetone to which some ether is added. The desoxycorticosterone crystals so obtained melt between 140° and 143°.

B: Dissolve 5 mg. of Desoxycorticosterone Acetate in 0.5 cc. of methanol and add 0.5 cc. of silver ammonium nitrate T. S. The latter is reduced in the cold, but is reduced faster upon heating, forming a black precipitate.

C: The ultra-violet absorption of Desoxycorticosterone Acetate in alcohol solution shows a maximum at 240 mμ and the logarithm of the extinction coefficient log ε = 4.22 at this wave length.

Packaging and storage—Preserve Desoxycorticosterone Acetate in well-closed, light-resistant containers.

AVERAGE DOSE—Intramuscular and implantation—As determined by the physician according to the needs of the patient.

Dextrose

DEXTROSE

Dextrosum

Dextros.—*d*-Glucose

$C_6H_{12}O_6.H_2O$ $\quad$ $CH_2OH.\overline{CH.(CHOH)_3.CHOH}.H_2O$ (O bridge between the marked CH and CHOH) $\quad$ Mol. wt. 198.17

Dextrose is a sugar usually obtained by the hydrolysis of starch.

Note—It is permissible to use a dextrose which does not conform to the official requirements for water of hydration, provided the product meets all other official requirements for purity and also provided suitable allowance is made for the difference in water content. If a Dextrose injection is labeled with respect to its dextrose content, the label should indicate the number of Gm. of U. S. P. (hydrous) Dextrose contained in each 100 cc.

Description—Dextrose occurs as colorless crystals or as a white, crystalline or granular powder. It is odorless, and has a sweet taste.

Solubility—One Gm. of Dextrose dissolves in about 1 cc. of water and in about 60 cc. of alcohol. It is more soluble in boiling water and in boiling alcohol.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Dextrose, determined in a solution containing, in each 100 cc., 10 Gm. of Dextrose, previously dried to constant weight at 100°, and 0.2 cc. of ammonia T.S., in a 200-mm. tube, is not less than +52.5° and not more than +53°.

Identification—Add a few drops of a solution of Dextrose (1 in 20) to 5 cc. of hot alkaline cupric tartrate T.S.: a copious red precipitate of cuprous oxide appears.

Color of solution—Dissolve 25 Gm. of Dextrose in sufficient water to make exactly 50 cc. of solution: the solution has no more color than a mixture of 47 cc. of water with 3 cc. of a solution prepared by mixing 1.0 cc. of cobaltous chloride C.S., 3.0 cc. of ferric chloride C.S., and 2.0 cc. of cupric sulfate C.S. with sufficient water to make 10 cc. The comparison must be made by viewing the solutions downward in matched Nessler tubes, against a white surface.

Acid—Dissolve 5 Gm. of Dextrose in 50 cc. of carbon dioxide-free water, add 3 drops of phenolphthalein T.S., and titrate with fiftieth-normal sodium hydroxide to the production of a distinct pink color: not more than 0.3 cc. of the fiftieth-normal sodium hydroxide is required.

Loss on drying—When dried to constant weight at 100°, Dextrose loses not less than 8 per cent and not more than 10 per cent of its weight.

Residue on ignition—Dextrose yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—A 2-Gm. portion of Dextrose shows no more *Chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 2-Gm. portion of Dextrose shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic—Dissolve 1.5 Gm. of Dextrose in 5 cc. of water, add 5 cc. of diluted sulfuric acid and 1 cc. of bromine T.S., and heat for 5 minutes on a water bath. Add 500

mg. of potassium iodide, follow with 5 drops of stannous chloride T.S., cool, and test for arsenic, page 618. The stain produced, if any, is not more intense than that produced in a similar test made with the same quantities of the reagents and 2 cc. of the standard arsenic solution (1.3 parts per million).

Heavy metals—Thoroughly char 5 Gm. of Dextrose in a porcelain dish, cool, add a mixture of 30 cc. of diluted hydrochloric acid and 3 cc. of bromine T.S., cover the dish, and boil gently for 10 minutes. Filter and wash the filter and residue with 25 cc. of hot water. Evaporate the filtrate to dryness, dissolve the residue in 15 cc. of water, then add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water. The heavy metals limit, page 657, for Dextrose is 5 parts per million. Perform a blank determination with the same quantities of reagents and in the same manner and make any necessary correction.

Dextrin—Boil 1 Gm. of finely powdered Dextrose with 15 cc. of alcohol under a reflux condenser: it dissolves completely.

Soluble starch, sulfites—To a solution of 1 Gm. of Dextrose in 10 cc. of water add 1 drop of iodine T.S.: the liquid is colored yellow.

Packaging and storage—Preserve Dextrose in well-closed containers.

Dextrose and Sodium Chloride Injection

DEXTROSE AND SODIUM CHLORIDE INJECTION

Injectio Dextrosi et Sodii Chloridi

Inj. Dextros. et Sod. Chlorid.

Dextrose and Sodium Chloride Injection is a sterile solution of dextrose and sodium chloride in water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_6H_{12}O_6.H_2O$ and of NaCl. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Caution—The sodium chloride content of this Injection is sometimes of high concentration. Dextrose and Sodium Chloride Injection containing a sodium chloride concentration corresponding to the sodium chloride content of isotonic sodium chloride solution is to be labeled "Dextrose Injection in Isotonic Sodium Chloride Solution." See *Labeling*, page 666.

Sterilize Dextrose and Sodium Chloride Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664, but bacteriostatic agents may be used only when the Injection is used as a sclerosing agent.

Identification—The Injection responds to the *Identification test* under *Dextrose*, page 161, and to the tests for *Sodium*, page 663, and for *Chloride*, page 659.

Heavy metals—Evaporate a volume of Dextrose and Sodium Chloride Injection, equivalent to 3 Gm. of the total solids, to dryness on a steam bath in a porcelain dish or crucible, then proceed as described in the test for *Heavy metals* under *Dextrose Injection*, page 163, beginning with "then thoroughly char the residue..."

Assay for dextrose—Transfer an accurately measured volume of Dextrose and Sodium Chloride Injection, containing from 2 to 5 Gm. of dextrose, to a 100-cc. volumetric flask. Add 0.2 cc. of ammonia T.S., dilute with water to exactly 100 cc., and mix well; then, after 30 minutes, determine the angular rotation in a 200-mm. tube at 25°. The observed rotation in degrees, multiplied by 1.0425, represents the weight of $C_6H_{12}O_6.H_2O$ in 100 cc. of the dilution.

Assay for sodium chloride—Transfer an accurately measured volume of the Injection, equivalent to about 200 mg. of sodium chloride, to a glass-stoppered flask, and dilute with water, if necessary, to about 50 cc. Add, while agitating, exactly 50 cc. of tenth-normal silver nitrate, then add 3 cc. of nitric acid and 3 cc. of nitrobenzene, and shake well. Add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 5.845 mg. of NaCl.

Pyrogen—Dextrose and Sodium Chloride Injection, diluted, if necessary, with water for injection to contain not more than 0.9 per cent of sodium chloride and not more than 5 per cent of dextrose, meets the requirements of the *Pyrogen Test*, page 679.

Packaging and storage—Preserve Dextrose and Sodium Chloride Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630. Dextrose and Sodium Chloride Injection for use as a sclerosing agent may be dispensed in multiple-dose containers holding not over 30 cc. of the Injection.

Dextrose Injection

DEXTROSE INJECTION

Injectio Dextrosi

Inj. Dextros.

Dextrose Injection is a sterile solution of dextrose in water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_6H_{12}O_6.H_2O$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Dextrose Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664, but bacteriostatic agents must not be added.

Identification—Dextrose Injection responds to the *Identification test* under ***Dextrose***, page 161.

Heavy metals—Evaporate a volume of Dextrose Injection, equivalent to 3 Gm. of dextrose, in a porcelain dish or crucible, to dryness on a steam bath, then thoroughly char the residue. Cool, add a mixture of 30 cc. of diluted hydrochloric acid and 3 cc. of bromine T.S., cover the dish, and boil gently for 10 minutes. Filter, and wash the filter and residue with 25 cc. of hot water. Evaporate the filtrate to dryness on a steam bath, then add to the residue 2 cc. of diluted acetic acid, dilute to 25 cc. with water, and add 10 cc. of hydrogen sulfide T.S. The resulting color, if any, is not darker than that of a control made in the same manner with the same quantities of the same reagents and to which 1.5 cc. of standard lead solution, page 657, has been added (5 parts per million).

Assay—Transfer an accurately measured volume of Dextrose Injection, containing 2 to 5 Gm. of dextrose, to a 100-cc. volumetric flask. Add 0.2 cc. of ammonia

T.S., dilute with water to exactly 100 cc., and mix well; then, after 30 minutes, determine the angular rotation in a 200-mm. tube at 25°. The observed rotation in degrees, multiplied by 1.0425, represents the weight of $C_6H_{12}O_6.H_2O$ in 100 cc. of the dilution.

Pyrogen—Dextrose Injection, diluted, if necessary, with water for injection to contain 5 per cent of dextrose, meets the requirements of the *Pyrogen Test*, page 679.

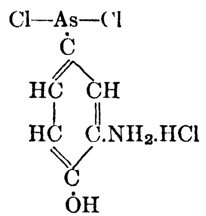
Packaging and storage—Preserve Dextrose Injection preferably in single dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Dichlorophenarsine Hydrochloride

DICHLOROPHENARSINE HYDROCHLORIDE

Dichlorophenarsinæ Hydrochloridum

Dichlorophenarsin. Hydrochlor.



$C_6H_6AsCl_2NO\ HCl$ Mol. wt. 290.41

Dichlorophenarsine Hydrochloride, when dried in a vacuum desiccator over phosphorus pentoxide for 24 hours, contains not less than 25.3 per cent and not more than 27 per cent of total arsenic (As).

Dichlorophenarsine Hydrochloride is usually distributed as a mixture with buffering agents and suitable substances to render its solution physiologically compatible with human blood. The label must indicate the names of the admixed substances, and the composition of the mixtures (containing Dichlorophenarsine Hydrochloride as the only active therapeutic agent) shall be approved by the National Institute of Health. Mixtures contain total arsenic equivalent to not less than 92.5 per cent and not more than 107.5 per cent of the labeled amount of Dichlorophenarsine Hydrochloride. Mixtures also meet the requirements for identification, loss on drying, completeness of solubility, and storage.

Dichlorophenarsine Hydrochloride and its mixtures must be prepared in an establishment licensed for the purpose by the United States Government upon the recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being

offered for sale must comply with the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Description—Dichlorophenarsine Hydrochloride occurs as a white, odorless powder.

Solubility—Dichlorophenarsine Hydrochloride is soluble in water, solutions of alkali hydroxides and carbonates, and in dilute mineral acids.

Identification—

A: Add 250 mg. of sodium hydrosulfite to about 50 mg. of Dichlorophenarsine Hydrochloride dissolved in 3 cc. of water: a salmon-colored precipitate which changes rapidly to yellow is formed.

B: Dissolve 10 mg. of Dichlorophenarsine Hydrochloride in 1 cc. of water, add 1 cc. of hydrochloric acid and 1 drop of hypophosphorous acid: a nearly white to yellow precipitate is produced.

Difference from oxophenarsine hydrochloride—Add about 50 mg. of Dichlorophenarsine Hydrochloride to 5 cc. of acetone contained in a test tube, insert a loose plug of cotton, and boil gently: the escaping vapors will turn blue litmus paper red.

Loss on drying—When dried in a vacuum desiccator over fresh phosphorus pentoxide for 24 hours, Dichlorophenarsine Hydrochloride loses not more than 0.5 per cent of its weight.

Completeness of solubility—Dichlorophenarsine Hydrochloride is completely soluble in water in a concentration as great as is recommended for its intravenous administration.

Percentage of trivalent arsenic—Dissolve about 250 mg. of Dichlorophenarsine Hydrochloride. previously dried for 24 hours in a vacuum desiccator over phosphorus pentoxide and accurately weighed, in 20 cc. of water, add 10 cc. of diluted sulfuric acid, and titrate the solution with tenth-normal iodine to the production of a pale yellow color. Each cc. of tenth-normal iodine is equivalent to 3.746 mg. of trivalent arsenic. It shows not less than 25 per cent and not more than 27 per cent of trivalent arsenic.

Assay for total arsenic—Place 130 to 150 mg. of Dichlorophenarsine Hydrochloride, previously dried in a vacuum desiccator over phosphorus pentoxide for 24 hours and accurately weighed, in a 250-cc. wide-mouthed Erlenmeyer flask. Add 10 cc. of sulfuric acid previously diluted with 10 cc. of water, then pour 15 cc. of 30 per cent hydrogen peroxide down the sides of the flask. Heat over a low flame until the fumes of sulfur trioxide rise freely. If the solution is not colorless at this point, add 2 cc. of 30 per cent hydrogen peroxide and heat as before. Cool, and add through a long-stem funnel 200 mg. of hydrazine sulfate, taking care to prevent the deposition of hydrazine sulfate crystals on the sides of the flask. Heat the solution gently to dissolve any crystals of hydrazine sulfate, and then boil for 10 minutes over a moderately high flame so regulated that the point of formation of sulfur trioxide fumes and the condensation of sulfuric acid is about 2 inches from the top of the flask. Cool, cautiously dilute with 50 cc. of water, and add 5 drops of a mixture of 1 cc. of methyl orange T.S. and 19 cc. of water. Titrate with tenth-normal potassium bromate, while still warm, until the color of the methyl orange is just discharged, adding the potassium bromate solution very slowly as the end-point is approached. Each cc. of tenth-normal potassium bromate is equivalent to 3.746 mg. of arsenic (As), or to 14.52 mg. of Dichlorophenarsine Hydrochloride.

Packaging and storage—Preserve Dichlorophenarsine Hydrochloride at a temperature preferably not above 25°, in hermetic containers of colorless glass which have been sterilized prior to filling, and from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the amount in grams or milligrams of the Dichlorophenarsine Hydrochloride contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label on the outside of the container of one or more ampuls must bear the official title, the amount in grams or milligrams of the Dichlorophenarsine Hydrochloride contained in the individual ampul, the names of the admixed substances,

if any, the lot number of the product, the name and address of the manufacturer, the U. S. license number of the manufacturer, and the expiration date for the product.

Expiration date—The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its quality) shall not be more than 3 years from the date of release of that lot by the National Institute of Health.

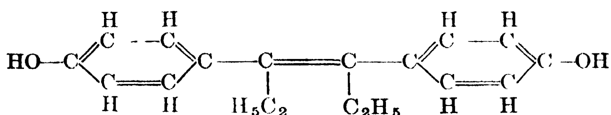
AVERAGE DOSE—Intravenous, **45 mg.** (approximately ¾ grain).

Diethylstilbestrol

DIETHYLSTILBESTROL

Diethylstilbestrol

Diethylstilbest.—Stilbœstrol



$C_{18}H_{20}O_2$ Mol. wt. 268.34

Diethylstilbestrol, when dried for 4 hours at 100°, contains not less than 98.5 per cent of $C_{18}H_{20}O_2$.

Description—Diethylstilbestrol occurs as a white, odorless, crystalline powder.

Solubility—Diethylstilbestrol is almost insoluble in water; it is soluble in alcohol, chloroform, ether, fatty oils, and in dilute alkali hydroxides.

Melting range—Diethylstilbestrol melts between 169° and 172°, page 667.

Melting range of the diacetate—The diacetate obtained in the *Assay* melts between 121° and 124°.

Identification—

A: Dissolve 10 mg. of Diethylstilbestrol in 1 cc. of sulfuric acid: an orange color is produced, which disappears upon dilution with about 10 volumes of water.

B: To a solution of 20 mg. of Diethylstilbestrol in 2 cc. of diluted alcohol add 1 drop of a mixture of 1 volume of ferric chloride T.S. with 9 volumes of water: a green color is produced which changes to yellow.

Acid or alkali—A solution of 100 mg. of Diethylstilbestrol in 5 cc. of 70 per cent alcohol is neutral to litmus paper.

Loss on drying—When dried at 100° for 4 hours, Diethylstilbestrol loses not more than 0.5 per cent of its weight.

Residue on ignition—Diethylstilbestrol yields not more than 0.05 per cent of residue on ignition, page 685.

Assay—Weigh accurately about 500 mg. of Diethylstilbestrol, previously dried for 4 hours at 100°, and boil it with 1.5 cc. of acetic anhydride and 3 cc. of pyridine under a reflux condenser for 5 minutes. Add 50 cc. of water, shake vigorously, and allow to stand for 1 hour. Collect the precipitate on a tared Gooch filter and wash it with water until the odor of pyridine is no longer perceptible. Dry the precipitate between 75° and 80° for 18 hours, cool, and weigh. The weight of the diacetate thus obtained, multiplied by 0.7615, represents its equivalent of $C_{18}H_{20}O_2$.

Packaging and storage—Preserve Diethylstilbestrol in tight, light-resistant containers.

AVERAGE DOSE—**0.5 mg.** (approximately $\frac{1}{120}$ grain).

DIETHYLSTILBESTROL CAPSULES

Capsulæ Diethylstilbestrolis

Cap. Diethylstilbest.

Diethylstilbestrol Capsules contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{18}H_{20}O_2$.

Assay—Place a counted number of not less than 20 Diethylstilbestrol Capsules in a small beaker or other suitable vessel, and break each capsule. Add about 25 cc. of peroxide-free ether or sufficient to cover the capsules, stir for 5 to 10 minutes, and then transfer the liquid to a separator. Treat the capsules with several small portions of ether in the manner just described, combining all of the ether extracts in the same separator. If the combined ether extracts measure more than 75 cc., evaporate, by gently warming, to this volume. Extract the ether at first with a 25-cc. portion, then with three 15-cc. portions of sodium hydroxide T.S. Render the combined sodium hydroxide extracts acid with diluted sulfuric acid and extract twice with 25-cc. portions, and then three times with 10-cc. portions of peroxide-free ether. Filter the combined ether extracts, and wash the filter with several small portions of the ether. Evaporate the ether by gently warming, dissolve the residue in 40 cc. of alcohol, completely transfer the solution with the aid of 10 cc. of alcohol to a 100-cc. volumetric flask, dilute with water to 100 cc., and mix well.

To an accurately measured aliquot of the solution, equivalent to 0.50 mg. of diethylstilbestrol, add 2 cc. of diluted hydrochloric acid and 4 cc. of molybdophosphotungstate T.S., and dilute with 50 cc. of water. Allow to stand for 10 minutes, then add 10 cc. of a 25 per cent solution of anhydrous sodium carbonate, dilute with water to exactly 100 cc., mix well, and allow to stand for 45 minutes. Filter the solution through a dry filter, rejecting the first portion of the filtrate. Dissolve 10.0 mg. of U. S. P. Diethylstilbestrol Reference Standard in sufficient diluted alcohol to make exactly 100 cc. Treat separate 4.5-cc. and 5.5-cc. portions of this solution with the same quantities of reagents and in the same manner as the aliquot of the sample being tested. Viewed transversely against a white background, the color of the final filtrate obtained from the Capsules is not lighter than that of the control prepared with 4.5 cc., and not darker than that of the control prepared with 5.5 cc. of the Reference Standard Solution.

Packaging and storage—Preserve Diethylstilbestrol Capsules in well-closed containers.

Sizes—Diethylstilbestrol Capsules usually available contain the following amounts of diethylstilbestrol: 0.1, 0.5, and 1.0 mg. ($\frac{1}{600}$, $\frac{1}{120}$, and $\frac{1}{60}$ grain).

Average dose of diethylstilbestrol—**0.5 mg.** (approximately $\frac{1}{120}$ grain).

DIETHYLSTILBESTROL INJECTION

Injectio Diethylstilbestrolis

Inj. Diethylstilbest.

Diethylstilbestrol Injection is a sterile solution of diethylstilbestrol in oil or in other suitable solvent. It contains not less than 90 per cent

and not more than 110 per cent of the labeled amount of $C_{18}H_{20}O_2$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Diethylstilbestrol Injection preferably by Process C. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, equivalent to about 5 mg. of diethylstilbestrol, to a separator, and dilute with ether to about 75 cc., then proceed with the assay as described under the *Assay* for *Diethylstilbestrol Capsules*, page 167, beginning with "Extract the ether at first with a 25-cc. portion."

Packaging and storage—Preserve Diethylstilbestrol Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Diethylstilbestrol Injection usually available contains the following amounts of diethylstilbestrol: 0.5 mg. (1/120 grain) in 1 cc.; 1 mg. (1/60 grain) in 1 cc.

AVERAGE DOSE OF DIETHYLSTILBESTROL—Intramuscular, **0.5 mg.** (approximately 1/120 grain).

Diethylstilbestrol Tablets

DIETHYLSTILBESTROL TABLETS

Tabellæ Diethylstilbestrolis

Tab. Diethylstilbest.

Diethylstilbestrol Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{18}H_{20}O_2$.

Assay—Weigh a counted number of not less than 20 Diethylstilbestrol Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered tablets, equivalent to about 5 mg. of diethylstilbestrol, suspend it in a separator in 30 cc. of water to which 2 drops of hydrochloric acid have been added, extract twice with 25-cc. portions, then two times with 10-cc. portions of peroxide-free ether, and proceed as directed in the *Assay* for *Diethylstilbestrol Capsules*, page 167, beginning with the words "Extract the ether at first."

Packaging and storage—Preserve Diethylstilbestrol Tablets in well-closed containers.
Sizes—Diethylstilbestrol Tablets usually available contain the following amounts of diethylstilbestrol: 0.1, 0.5, and 1.0 mg. ($\frac{1}{600}$, $\frac{1}{120}$, and $\frac{1}{60}$ grain).

AVERAGE DOSE OF DIETHYLSTILBESTROL—**0.5 mg.** (approximately $\frac{1}{120}$ grain).

Digitalis

DIGITALIS

Digitalis

Digit.—Foxglove, Digitalis folium P.I.

Digitalis is the dried leaf of *Digitalis purpurea* Linné (Fam. *Scrophulariaceæ*).

The potency of Digitalis is such that, when assayed as directed, 0.1 Gm. shall be equivalent to not less than 1.0 U. S. P. Digitalis Unit. One *United States Pharmacopœial Digitalis Unit* represents the potency of 0.1 Gm. of the U. S. P. Digitalis Reference Standard, page 681.

Note—When Digitalis is prescribed, Powdered Digitalis is to be dispensed.

Description—

Unground Digitalis—More or less crumpled or broken; blades ovate-lanceolate, mostly 10 to 35 cm. in length and 4 to 11 cm. in width and contracted into a winged petiole; margin crenate or irregular; the lower surface densely pubescent, upper surface wrinkled, finely hairy; venation conspicuously reticulate, the mid-rib and principal veins broad and flat and the lower veins continued into the wings of the petiole; color of the upper surface dark green, of lower surface grayish from the dense pubescence, the larger veins often purplish; odor slight when dry, peculiar and characteristic when moistened; taste very bitter.

Histology—Upper epidermis with slightly wavy vertical walls, numerous hairs and no stomata; lower epidermis with wavy vertical walls, numerous oval stomata and many hairs, and frequently not attached over irregular areas, to the cell layer within, especially near the veins; chlorenchyma of a single layer of short palisade cells and several layers of spongy parenchyma; vascular bundles of larger veins and petioles, numerous, separated by medullary rays 1 cell wide.

Ground Digitalis—Dark green; numerous irregular fragments of epidermis; non-glandular hairs frequently curved or crooked, up to 500 microns in length, uniseriate, 2 to 8 cells, some of the cells collapsed so that the planes of adjoining cells may be at right angles, the terminal cell pointed or occasionally rounded; glandular hairs few, small, usually with a 1- or 2-celled stalk and a 1- or 2-celled head; fragments of veins and petioles with tracheæ annular, reticulate or spiral or with simple pores; calcium oxalate absent.

Moisture—The amount of *Moisture* in Digitalis does not exceed 6 per cent when determined by Method VII or Method IX, pages 710 and 712.

Foreign organic matter—The amount of *stems, browned leaves, flowers,* or *other foreign organic matter* in Digitalis does not exceed 2 per cent, page 711.

Acid-insoluble ash—Digitalis yields not more than 5 per cent of *Acid-insoluble ash*, page 711.

Assay—Proceed as directed under the *Assay* for *Digitalis Tincture*, page 173, weighing, to the nearest milligram, at least 5 Gm. of Digitalis, in fine powder, in a weigh-

ing bottle, and making from it a *preparation to be assayed*, using the same method that is described for the *Standard preparation of digitalis*. Digitalis is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from such requirement.

Packaging, storage and labeling—Preserve Digitalis under all conditions of storage and transportation under such conditions as will maintain not more than the specified moisture content, provided that Digitalis to be used exclusively for the manufacture of glycosides and labeled "Digitalis—To be used only in the manufacture of glycosides," is exempt from the storage and moisture requirements.

Digitalis Capsules

DIGITALIS CAPSULES

Capsulæ Digitalis

Cap. Digit.

Digitalis Capsules contain an amount of powdered digitalis corresponding to not less than 95 per cent and not more than 105 per cent of the labeled amount of powdered digitalis (see page 172).

Assay—*Capsules of dry powdered digitalis*—Empty the contents of a sufficient number, not less than 20, of the capsules into a hard glass, glass-stoppered container of at least 50-cc. capacity. Add a menstruum consisting of 4 parts of alcohol, by volume, and 1 part of water, by volume, so that the total volume of menstruum corresponds to 1 cc. for each expected U. S. P. Digitalis Unit. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 ± 2 hours at 25° ± 5° by mechanical means which continuously brings the solid material into fresh contact with the liquid phase. Immediately thereafter transfer to a centrifuge tube, centrifuge, and decant into a dry, hard glass bottle having a tight closure. Preserve under refrigeration until used. Do not use for assay after a period of more than 30 days. Assay as directed under *Digitalis Tincture*, page 173.

Capsules of digitalis suspended in water-immiscible media (oil, fat, wax, etc.)—Cut a sufficient number, not less than 20, of the capsules, into halves in a dry, shallow glass container. Transfer the contents, together with the capsules, quantitatively, with the aid of a sufficient amount of petroleum benzin to a dry, hard glass, glass-stoppered container of suitable capacity. Add sufficient petroleum benzin to make a volume approximately 3 times the volume occupied by the capsule fragments and the contents of the capsules. Shake vigorously and centrifuge. Decant and discard the petroleum benzin extract. Repeat the petroleum benzin extraction twice. Place the extraction container with its contents, with the stopper removed, in an oven at 60° for 8 hours. Remove it from the oven, allow it to cool, and add menstruum consisting of 4 parts of alcohol, by volume, and 1 part of water, by volume, so that the total volume of menstruum corresponds to 1 cc. for each expected U. S. P. Digitalis Unit. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 ± 2 hours at 25° ± 5° by mechanical means which continuously brings the solid material into fresh contact with the liquid phase. Immediately thereafter transfer to a centrifuge tube, centrifuge the mixture, and decant into a dry, hard glass bottle having a tight closure. Preserve under refrigeration until used. Do not use for assay after a period of more than 30 days. Assay as directed under *Digitalis Tincture*, page 173.

Digitalis Capsules are considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 25 per cent from the labeled potency.

Storage—Preserve Digitalis Capsules in well-closed containers.
Sizes—Digitalis Capsules usually available contain the following amounts of digitalis: 50 and 100 mg. (¾ and 1½ grains).

AVERAGE DOSE OF DIGITALIS—**0.1 Gm.** (approximately 1½ grains).

Digitalis Injection

DIGITALIS INJECTION

Injectio Digitalis

Inj. Digit.

Digitalis Injection is a sterile solution in water for injection of a mixture of glycosides or therapeutically desirable and cardioactive constituents of digitalis. Its potency is to be indicated on the label in terms of U. S. P. Digitalis Units. Digitalis Injection meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Digitalis Injection preferably by Process F. See *Sterilization Processes*, page 692.

Digitalis Injection may contain not more than 10 per cent of alcohol as a preservative.

The Injection also conforms to the other requirements under *Injections*, page 664, except at times it may show signs of a slight turbidity or precipitate.

Caution—For the purposes of standardization, Digitalis Injection is assayed by the U. S. P. biological method and its potency is expressed in terms of U. S. P. Digitalis Units. Preparations of this type are intended for parenteral administration and when injected may show an effect much greater than that of an equivalent number of U. S. P. Digitalis Units when administered orally in the form of digitalis leaf or digitalis leaf preparations. The dosage, therefore, should be that recommended in the labeling.

Assay—Proceed as directed under *Digitalis Tincture*, page 173. Digitalis Injection is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from the labeled potency.
Storage—Preserve Digitalis Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.
Sizes—Digitalis Injection usually available contains the following equivalent of digitalis: 1 U. S. P. unit in 1 cc.; 1 U. S. P. unit in 2 cc.

AVERAGE DOSE—The dose recommended on the label.

Digitalis, Powdered

POWDERED DIGITALIS

Digitalis Pulverata

Digit. Pulverat.

Digitalis, dried at a temperature not exceeding 60°, reduced to a fine or a very fine powder, and adjusted, if necessary, to conform to the official potency by admixture with sufficient lactose, starch, or exhausted marc of digitalis, or with a powdered digitalis having either a lower or a higher potency. Powdered Digitalis contains not more than 5 per cent of moisture.

The potency of Powdered Digitalis is such that, when assayed as directed, 0.1 Gm. shall be equivalent to 1.0 U. S. P. Digitalis Unit, page 169.

Note—When Digitalis is prescribed, Powdered Digitalis is to be dispensed.

Description and physical properties—It conforms to the description for *Ground Digitalis* under *Digitalis*, page 169.

Assay—Proceed as directed under *Digitalis*, page 169, making any necessary adjustments. Powdered Digitalis is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from such requirement.

Packaging and storage—Preserve Powdered Digitalis in tight, light-resistant containers. A suitable cartridge or device, containing a non-liquefying, inert, dehydrating substance may be used in the container to maintain low humidity.

AVERAGE DOSE—**0.1 Gm.** (approximately 1½ grains).

Digitalis Tablets

DIGITALIS TABLETS

Tabellæ Digitalis

Tab. Digit.

Digitalis Tablets contain an amount of powdered digitalis corresponding in potency to not less than 95 per cent and not more than 105 per cent of the labeled amount of powdered digitalis.

Assay—Weigh a counted number of not less than 25 Digitalis Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to not less than 20 Tablets, transfer it quantitatively to a dry, hard-glass, glass-stoppered container of at least 50-cc. capacity and add sufficient menstruum consisting of 4 parts of alcohol, by volume, and 1 part of water, by volume, so that the total volume of menstruum corresponds to 1 cc. for each expected U. S. P. Digitalis Unit. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 hours ± 2 hours at 25° ± 5° by mechanical means which continuously brings the solid material into fresh contact with the liquid phase. Immediately thereafter transfer to a centrifuge tube, centrifuge the mixture, and decant into a dry, hard-glass bottle having a tight closure. Preserve under refrigeration until used. Do not use for assay after a period of more than 30 days. Assay as directed under *Digitalis Tincture*, page 173. Digitalis Tablets are considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 25 per cent from the labeled potency.

Storage—Preserve Digitalis Tablets in tight containers.

Sizes—Digitalis Tablets usually available contain the following amounts of digitalis: 50 and 100 mg. (¾ and 1½ grains).

AVERAGE DOSE OF POWDERED DIGITALIS—**0.1 Gm.** (approximately 1½ grains).

Digitalis Tincture

DIGITALIS TINCTURE

Tinctura Digitalis

Tr. Digit.—Tinctura Digitalis P.I.

The potency of Digitalis Tincture shall be such that, when assayed as directed, 1 cc. of the Tincture shall be equivalent to 1.0 U. S. P. Digitalis Unit, page 169.

DIGITALIS, in fine powder..........................	100 Gm.
To make about.....................	1000 cc.

Prepare a Tincture by Process P, as modified for assayed tinctures, page 708, using a mixture of 4 volumes of alcohol and 1 volume of water as the menstruum. Finally adjust the Tincture to conform to the specified potency.

Assay—

The standard preparation of digitalis—Weigh the contents of one ampul of Digitalis Reference Standard to the nearest milligram, either in the original ampul or in a weighing bottle, and transfer to a dry, hard-glass, glass-stoppered container of at least 50-cc. capacity. Complete the weighing within 5 minutes after opening the ampul. Add sufficient menstruum consisting of 4 parts of alcohol, by volume, and 1 part of water, by volume, so that the total volume of menstruum added corresponds to 10 cc. for each Gm. of powder. Insert the stopper, the upper third of which is greased lightly with petrolatum. Shake the mixture for 24 hours ±2 hours at 25° ±5° by mechanical means which continuously

brings the solid material into fresh contact with the liquid phase. Immediately thereafter, centrifuge the mixture and decant into a dry, hard-glass bottle having a tight closure, and preserve under refrigeration until used. Do not use for assay after a period of more than 30 days.

The cats—Select domestic cats free of gross evidence of disease and weighing between 1.5 and 4.0 Kg., except that in any one assay the weight of the largest cat shall not be more than twice that of the smallest cat. Do not use cats which upon gross examination are either obese, emaciated, lactating, or pregnant. Withhold food for from 16 to 28 hours prior to use. Assign all cats at random with the restriction that the two groups, the one for the standard preparation and the one for the specimen to be assayed, shall not differ by more than 50 per cent in the average of their weights. Lightly anesthetize the cat with ether, and immobilize, preparatory to the injection. Insert a cannula in a femoral vein and arrange to inject the appropriate test dilution from a burette calibrated to 0.1 cc. after insuring the absence of air bubbles from the injection apparatus. Maintain the anesthesia throughout the injection in such a state that pain is absent, the pupillary and corneal reflexes are present, the voluntary musculature is not relaxed, and the cat occasionally moves its tail or makes some other voluntary movement.

Preparation of the test dilutions—Dilute the Standard Preparation of Digitalis and the preparation to be assayed in such a way that the estimated fatal dose of each preparation per Kg. of cat will be diluted to 15 cc. with isotonic sodium chloride solution. Make test dilutions the day they are to be used.

Injection of the dilutions—Inject 1 cc. of the diluted material for each Kg. of the body weight of the cat, within a few seconds. Repeat this dose at 5-minute intervals until the cat dies from the cessation of the heart beat.

Use a total of not less than 6 cats for the Standard Preparation of Digitalis and not less than 6 cats for the preparation to be assayed. If the average number of doses for any given dilution required to produce death is less than 13 or greater than 19, or if the larger exceeds the smaller in the same assay by more than 4 doses, regard these data as preliminary. Use them as a guide, and repeat with a fresh, higher, or lower dilution. Complete the assay within a period of 15 days.

Calculation of the potency—Express the lethal dose for each cat in terms of the cc. of tincture per Kg. of live body weight. Compute the average lethal dose of the Standard Preparation and that of the preparation to be assayed. Compute the standard error of each average lethal dose as directed below and express each standard error as a percentage of the respective average lethal dose. If the standard error of either average exceeds 5.7 per cent, repeat the determination of the lethal dose of the Standard Preparation or of the preparation to be assayed, as the case may be, or use additional cats until the standard error falls within this limit. Express the potency of the preparation to be assayed in U. S. P. Digitalis Units per cc. by dividing the average for the Standard Preparation by the average for the preparation to be assayed.

To compute the standard error of the average, take the difference between the average and the value found for each cat. Square these differences, take their sum, divide this sum by the number of cats, and divide this quotient by the number of cats diminished by 1. The square root of the last quotient is the standard error of the average.

The formula for the standard error of the average ($S.E._{av}$) is:

$$\sqrt{\frac{\text{sum } (c - \bar{c})^2}{N(N-1)}}$$

c = lethal dose for each cat.
$\bar{c}$ = average lethal dose for the group of cats.
N = number of cats in the group.

Digitalis Tincture is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from such requirement.

Packaging and storage—Preserve Digitalis Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 70 to 75 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—**1 cc.** (approximately 15 minims).

Digitoxin

DIGITOXIN

Digitoxinum

Digitox.

Digitoxin is either pure digitoxin ($C_{41}H_{64}O_{13}$) or a mixture of cardioactive glycosides obtained from *Digitalis purpurea* Linné (Fam. *Scrophulariaceæ*) and consisting chiefly of digitoxin. The potency of Digitoxin corresponds to the potency of an equal weight of U. S. P. Digitoxin Reference Standard.

Caution—Digitoxin is extremely poisonous.

Description—Digitoxin is a white or pale buff, odorless, microcrystalline powder.
Solubility—Digitoxin is insoluble in water and very slightly soluble in ether. One Gm. dissolves in about 40 cc. of chloroform and in about 60 cc. of alcohol.
Identification—Add 0.5 cc. of ferric chloride T.S. to 100 cc. of glacial acetic acid, and mix well. Dissolve about 1 mg. of Digitoxin in 2 cc. of this solution and underlay it with 2 cc. of sulfuric acid: at the zone of contact of the two liquids a brown color is produced which gradually changes to light green, then to blue and finally the entire acetic acid layer acquires a blue color.
Loss on drying—When dried at 100° for 2 hours, Digitoxin loses not more than 1 per cent of its weight.
Residue on ignition—The residue on ignition from 100 mg. of Digitoxin is negligible.
Completeness of solution in chloroform—Frequently agitate 100 mg. of Digitoxin with 5 cc. of chloroform in a tightly-stoppered cylinder: the Digitoxin dissolves completely within 24 hours with or without opalescence.
Digitonin—Dissolve 10 mg. of Digitoxin in 2 cc. of alcohol in a test tube, the inner walls of which are free from scratches, add 2 cc. of a solution of cholesterol in alcohol (1 in 200), and mix by gentle agitation: no precipitate is formed within 10 minutes.
Assay—Prepare a *Standard preparation of digitoxin* by dissolving U. S. P. Digitoxin Reference Standard in sufficient diluted alcohol to make a 1 to 2000 solution with an accuracy within 1 per cent. Preserve this stock solution in a cold place in a tight glass container and do not use it for assays after a period of more than 6 months. In the same manner prepare a solution of the Digitoxin to be tested. This is the *preparation to be assayed*.

Proceed as directed in the *Assay* for *Digitalis Tincture*, page 173, beginning with the second paragraph, and substituting the *Standard preparation of digitoxin* for the *Standard preparation of digitalis*, deleting the sentence beginning "Express the potency . . .," and do not use the *test dilutions* after a period of more than 3 hours. Digitoxin is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from such requirement.

Packaging and storage—Preserve Digitoxin in well-closed containers.

AVERAGE DOSE—Oral, 0.1 mg. (approximately 1/600 grain). Intravenous, to be determined by the physician according to the needs of the patient.

Digitoxin Injection

DIGITOXIN INJECTION

Injectio Digitoxini

Inj. Digitox.

Digitoxin Injection is a sterile solution of digitoxin in 40 to 50 per cent alcohol. Glycerin may also be present. The Injection contains in each cc. the labeled amount of digitoxin. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Digitoxin Injection preferably by Process C. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under Injections, page 664.

Colorimetric control—Proceed as directed under *Digitoxin Colorimetric Controls*, page 640. The result corresponds to not less than 90 per cent and not more than 110 per cent of the labeled amount of digitoxin.

Assay—Proceed as directed under the *Assay* for *Digitoxin*, page 175, using the Injection as the *preparation to be assayed.* Digitoxin Injection is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from the labeled potency.

Packaging and storage—Preserve *Digitoxin Injection* in hermetic containers, or other suitable containers. Protect from light.

Sizes—*Digitoxin Injection* usually available contains the following amounts of digitoxin: 0.2 mg. (1/300 grain) in 1 cc.; 0.4 mg. (1/150 grain) in 2 cc.

AVERAGE DOSE OF DIGITOXIN—Intravenous, to be determined by the physician according to the needs of the patient.

Digitoxin Tablets

DIGITOXIN TABLETS

Tabellæ Digitoxini

Tab. Digitox.

Digitoxin Tablets contain the labeled amount of digitoxin.

Colorimetric control—Proceed as directed under *Digitoxin Colorimetric Controls*, page 640. The result corresponds to not less than 90 per cent and not more than 110 per cent of the labeled amount of digitoxin.

Assay—Triturate a counted number of not less than 40 Digitoxin Tablets in a glass mortar, with the aid of a sufficient amount of 80 per cent alcohol, until the Tablets have completely disintegrated. Transfer the mixture completely, with the aid of 80 per cent alcohol, to a hard-glass, glass-stoppered, centrifuge tube, and add sufficient 80 per cent alcohol so that the total volume of 80 per cent alcohol corresponds to 5 cc. for each expected milligram of digitoxin. Shake the mixture continuously for 2 hours at 25° ± 5° in a mechanical shaker, centrifuge, and collect the clear, supernatant liquid. Repeat the extraction with 80 per cent alcohol, mix the two extracts thoroughly, use this solution, corresponding to 10 cc. for each expected milligram of digitoxin, as the *preparation to be assayed*, and proceed as directed under the *Assay* for *Digitoxin*, page 175. Digitoxin Tablets are considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 25 per cent from the labeled potency.

Packaging and storage—Preserve *Digitoxin Tablets* in well-closed containers.

Sizes—Digitoxin Tablets usually available contain the following amounts of digitoxin: 0.1 and 0.2 mg. (1/600 and 1/300 grain).

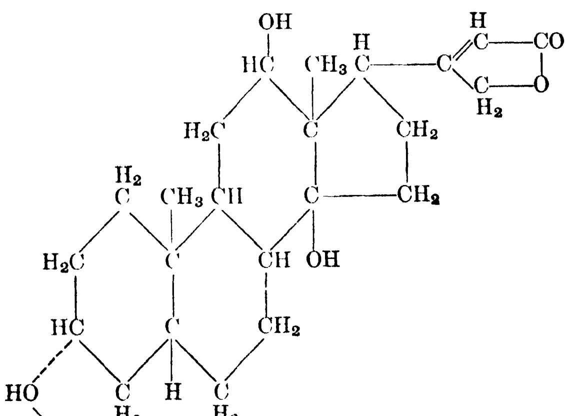
AVERAGE DOSE OF DIGITOXIN—**0.1 mg.** (approximately 1/600 grain).

Digoxin

DIGOXIN

Digoxinum

Digox.



(OHC.CH₂.CHOH.CHOH.CHOH.CH₃)₃ less 3H₂O

$C_{41}H_{64}O_{14}$ Mol. wt. 780.92

Digoxin is a glycoside obtained from the leaves of *Digitalis lanata*, Ehrh. (Fam. *Scrophulariaceæ*).

Caution—Digoxin is extremely poisonous.

Description—Digoxin occurs as colorless to white crystals or as a white, crystalline powder. It is odorless. It melts indistinctly, and with decomposition, at about 265°.

Solubility—Digoxin is insoluble in water, in chloroform, and in ether. It is freely soluble in pyridine and soluble in dilute alcohol.

Specific rotation—The specifiic rotation of Digoxin, determined at 20° in a solution in anhydrous pyridine containing 1 Gm. of Digoxin in 10 cc. of solution, using a mercury light at 546.1 mμ, and a 200 mm. tube, is not less than +13.4° and not more than +13.8°.

NOTE—The anhydrous pyridine must be freshly distilled over sodium hydroxide from glass apparatus, using a fractionating column. Only the portion which distils between 114° and 115° is used in the determination of the specific rotation.

Identification—Add 0.5 cc. of ferric chloride T.S. to 100 cc. of glacial acetic acid, and mix well. Dissolve about 1 mg. of Digoxin in 2 cc. of this solution and underlay with 1 cc. of sulfuric acid: a brown ring, free from red, is produced at the junction of the two liquids. After some time the acetic acid layer acquires a blue color.

Loss on drying—When dried in vacuum over sulfuric acid, Digoxin loses not more than 0.5 per cent of its weight.

Residue on ignition—The residue on ignition from 100 mg. of Digoxin is negligible.

Packaging and storage—Preserve Digoxin in tight, light-resistant containers.

AVERAGE DOSE—Oral, **0.5 mg.** (approximately 1/120 grain). Intravenous, to be determined by the physician according to the needs of the patient.

Digoxin Injection

DIGOXIN INJECTION

Injectio Digoxini

Inj. Digox.

Digoxin Injection is a sterile solution of digoxin in 70 per cent alcohol. The Injection contains, in each cc., the labeled amount of digoxin. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Digoxin Injection preferably by Process C. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Assay—Prepare a *Standard preparation of digoxin* by dissolving U. S. P. Digoxin Reference Standard in sufficient 70 per cent alcohol to make a 1 to 1000 solution

with an accuracy within 1 per cent. Preserve this stock solution in a cold place, in a tight glass container, and do not use it for assays after a period of more than 6 months.

Use the Injection as the *preparation to be assayed* and proceed as directed in the *Assay* of *Digitalis Tincture*, page 173, beginning with the second paragraph, and substituting the *Standard preparation of digoxin* for the *Standard preparation of digitalis*, deleting the sentence beginning "Express the potency . . .," and do not use the *test dilutions* after a period of more than 3 hours. Digoxin Injection is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from the labeled potency.

Alcohol content—From 67 to 73 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Digoxin Injection in single dose, hermetic containers. Protect from light.

Sizes—Digoxin Injection usually available contains the following amount of digoxin: 0.5 mg. (1/120 grain) in 1 cc.

AVERAGE DOSE OF DIGOXIN—Intravenous, to be determined by the physician according to the needs of the patient.

Digoxin Tablets

DIGOXIN TABLETS

Tabellae Digoxini

Tab. Digox.

Digoxin Tablets contain the labeled amount of digoxin.

Assay—Triturate a counted number of not less than 40 Digoxin Tablets in a glass mortar, with the aid of a sufficient amount of 70 per cent alcohol, until the Tablets have completely disintegrated. Transfer the mixture completely, with the aid of 70 per cent alcohol, to a hard-glass, glass-stoppered, centrifuge tube, and add sufficient 70 per cent alcohol, so that the total volume of 70 per cent alcohol corresponds to 5 cc. for each expected milligram of digoxin. Shake the mixture continuously for 2 hours at 25° ± 5° in a mechanical shaker, centrifuge, use the supernatant, clear liquid as the *preparation to be assayed*, and proceed as directed under the *Assay* of *Digoxin Injection*, page 178. Digoxin Tablets are considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 25 per cent from the labeled potency.

Packaging and storage—Preserve Digoxin Tablets in a tight container.

Sizes—Digoxin Tablets usually available contain the following amount of digoxin: 0.25 mg. (1/250 grain).

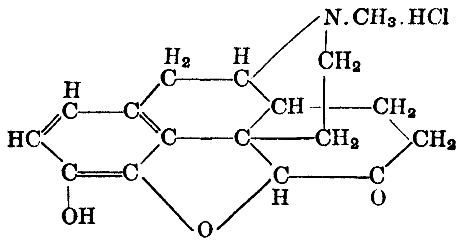
AVERAGE DOSE OF DIGOXIN—**0.5 mg.** (approximately 1/120 grain).

Dihydromorphinone Hydrochloride

DIHYDROMORPHINONE HYDROCHLORIDE

Dihydromorphinoni Hydrochloridum

Dihydromorph. Hydrochlor.



$C_{17}H_{19}O_3N.HCl$ Mol. wt. 321.80

Description—Dihydromorphinone Hydrochloride occurs as a fine, white, odorless, crystalline powder. It is affected by light.

Solubility—One Gm. of Dihydromorphinone Hydrochloride dissolves in about 3 cc. of water. It is sparingly soluble in alcohol, and nearly insoluble in ether.

Identification—

A: Dissolve about 250 mg. of Dihydromorphinone Hydrochloride in 25 cc. of water, add enough ammonia T.S. to render the mixture distinctly alkaline, and allow it to stand overnight. Collect the precipitate on a filter, wash it with 50 cc. of cold water, remove the water by suction, and dry for 4 hours at 100°. The precipitate of dihydromorphinone melts with decomposition at about 260°, page 667.

B: The filtrate obtained in *Identification test A*, when acidified with diluted nitric acid, responds to the identity tests for *Chloride*, page 659.

C: Dissolve 250 mg. of Dihydromorphinone Hydrochloride in 2 cc. of water, and add it to a solution of 1 Gm. of hydroxylamine hydrochloride in 5 cc. of water. Warm the mixture to about 80°, add an excess of ammonia T.S., and allow to stand overnight. Collect the precipitate of dihydromorphinone oxime on a filter, wash with 50 cc. of a mixture of 1 volume of ammonia T.S. and 99 volumes of water, remove the excess water by suction, and dry for 4 hours at 100°: the precipitate melts with decomposition between 230° and 235°.

D: Dissolve 10 mg. of Dihydromorphinone Hydrochloride in 1 cc. of water, and add a mixture of 5 cc. of potassium ferricyanide T.S. and 5 drops of ferric chloride T.S.: a deep blue color is produced at once.

Free acid—Dissolve 300 mg. of Dihydromorphinone Hydrochloride in 10 cc. of water, and titrate the solution with fiftieth-normal sodium hydroxide, using 1 drop of methyl red T.S. as the indicator: not more than 0.3 cc. of the fiftieth-normal sodium hydroxide is required to produce a yellow color.

Loss on drying—When dried at 100° for 4 hours, Dihydromorphinone Hydrochloride loses not more than 1.5 per cent of its weight.

Residue on ignition—The residue on ignition from 200 mg. of Dihydromorphinone Hydrochloride is negligible, page 685.

Sulfate—To 5 cc. of a solution of Dihydromorphinone Hydrochloride (1 in 30) add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity is produced.

Ammonium salts—To 100 mg. of Dihydromorphinone Hydrochloride add 5 cc. of sodium hydroxide T.S., and heat the mixture to boiling: no odor of ammonia is evolved.

Codeine—Dissolve 20 mg. of Dihydromorphinone Hydrochloride in 5 cc. of sulfuric acid, and add 1 drop of ferric chloride T.S.: no blue color results.

Packaging and storage—Preserve Dihydromorphinone Hydrochloride in tight, light-resistant containers.

AVERAGE DOSE— **2 mg.** (approximately 1/30 grain).

Dihydromorphinone Hydrochloride Tablets

DIHYDROMORPHINONE HYDROCHLORIDE TABLETS

Tabellæ Dihydromorphinoni Hydrochloridi

Tab. Dihydromorph. Hydrochlor.

Dihydromorphinone Hydrochloride Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{17}H_{19}O_3N.HCl$.

Identification—

A: Dissolve a quantity of Dihydromorphinone Hydrochloride Tablets, equivalent to about 100 mg. of dihydromorphinone hydrochloride, in 10 cc. of water, and filter if necessary. Precipitate the base as described in *Identification test A* under *Dihydromorphinone Hydrochloride*, using proportionate quantities of the reagent. The base so obtained melts with decomposition at about 260°. A 10-mg. portion of the base, dissolved in 1 drop of diluted hydrochloric acid and 1 cc. of water, responds to *Identification test D* under *Dihydromorphinone Hydrochloride*, page 180.

B: The filtrate obtained from the precipitation of the base, when acidified with nitric acid, responds to the silver nitrate test for *Chloride*, page 659.

Assay—Weigh a counted number of not less than 20 Dihydromorphinone Hydrochloride Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 70 mg. of dihydromorphinone hydrochloride, and transfer it completely to a separator with the aid of 10 cc. of water. Add 10 cc. of a cold saturated solution of sodium bicarbonate, and extract at first with 30-cc., then with 20-cc. portions of chloroform until the alkaloid is completely extracted. Wash the combined chloroform extracts with 10 cc. of water, filter the chloroform through a filter moistened with chloroform, and wash the separator and filter twice with 5-cc. portions of chloroform. Evaporate the chloroform nearly to dryness on a steam bath with the aid of a current of air, add to the residue exactly 25 cc. of fiftieth-normal sulfuric acid and 5 cc. of water, and heat gently to expel any remaining chloroform. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 6.436 mg. of $C_{17}H_{19}O_3N.HCl$.

Packaging and storage—Preserve Dihydromorphinone Hydrochloride Tablets in tight, light-resistant containers.

Sizes—Dihydromorphinone Hydrochloride Tablets usually available contain the following amounts of dihydromorphinone hydrochloride: 1, 2, and 4 mg. (1/60, 1/30, and 1/15 grain).

AVERAGE DOSE OF DIHYDROMORPHINONE HYDROCHLORIDE—
2 mg. (approximately 1/30 grain).

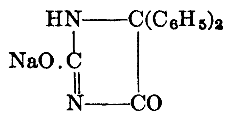
	PAGE
Diluted Alcohol	20
Diluted Hydriodic Acid	257
Diluted Hydrochloric Acid	260

Diphenylhydantoin Sodium

DIPHENYLHYDANTOIN SODIUM

Diphenylhydantoinum Sodicum

Diphenylhydant. Sod.—Soluble Phenytoin



$C_{15}H_{11}N_2O_2Na$ Mol. wt. 274.25

Diphenylhydantoin Sodium, when dried at 100° for 4 hours, contains not less than 90.5 per cent and not more than 92 per cent of diphenylhydantoin ($C_{15}H_{12}N_2O_2$).

Description—Diphenylhydantoin Sodium occurs as a white, odorless powder. It is somewhat hygroscopic and on exposure to air gradually absorbs carbon dioxide with the liberation of diphenylhydantoin.

Solubility—Diphenylhydantoin Sodium is freely soluble in water, the solution usually being somewhat turbid due to partial hydrolysis. It is soluble in alcohol, but practically insoluble in ether and in chloroform.

Identification—

A: Dissolve about 500 mg. of Diphenylhydantoin Sodium in 10 cc. of water, and add 5 cc. of diluted hydrochloric acid: a white precipitate of diphenylhydantoin is formed. Collect the precipitate on a filter, wash it well with cold water, and dry for 6 hours at 100°: the diphenylhydantoin so obtained melts between 292° and 299° with some decomposition, page 667.

B: The residue obtained on ignition of about 250 mg. of Diphenylhydantoin Sodium effervesces with acids, and responds to the test for *Sodium*, page 663.

Loss on drying—When dried for 4 hours at 100°, Diphenylhydantoin Sodium loses not more than 2.5 per cent of its weight.

Clarity and color of solution—Dissolve 1 Gm. of Diphenylhydantoin Sodium in 20 cc. of recently boiled and cooled water, and add tenth-normal sodium hydroxide until the hydrolyzed diphenylhydantoin is dissolved: it requires not more than 4 cc. of the tenth-normal sodium hydroxide to produce a clear colorless solution.

Heavy metals—Dissolve 500 mg. of Diphenylhydantoin Sodium in 20 cc. of water, add 1 cc. of sodium hydroxide T.S., dilute with water to 25 cc., and add 5 drops of sodium sulfide T.S. If a dark color is produced, it is not darker than that in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 300 mg. of Diphenylhydantoin Sodium, previously dried for 4 hours at 100°, and transfer to a separator. Add 50 cc. of water and 10 cc. of diluted hydrochloric acid, and extract with 100 cc. of absolute ether, then with four successive portions of 25 cc. each of absolute ether. Evaporate the combined ether extracts, and dry the residue of $C_{15}H_{12}N_2O_2$ to constant weight at 100°.

Packaging and storage—Preserve Diphenylhydantoin Sodium in tight containers.

AVERAGE DOSE—**0.1 Gm.** (approximately 1½ grains).

Diphenylhydantoin Sodium Capsules

DIPHENYLHYDANTOIN SODIUM CAPSULES

Capsulæ Diphenylhydantoini Sodici

Cap. Diphenylhydant. Sod.

Diphenylhydantoin Sodium Capsules contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $C_{15}H_{11}N_2O_2Na$.

Identification—

A: Ignite the contents of 1 or 2 Diphenylhydantoin Sodium Capsules: the residue effervesces with acids and responds to the flame test for *Sodium*, page 663.

B: The diphenylhydantoin obtained in the *Assay* melts between 292° and 299° with some decomposition, page 667.

Assay—Transfer as completely as possible the contents of a counted number of not less than 20 Diphenylhydantoin Sodium Capsules to a beaker. Place the emptied capsules in another beaker, add sufficient alcohol to cover them completely, and allow to stand for 30 minutes with frequent stirring. Filter into the beaker containing the contents of the capsules, and wash the capsules and filter well with alcohol. Evaporate the liquid nearly to dryness on a steam bath, and dissolve the residue in 45 cc. of water and 5 cc. of sodium hydroxide T.S. Transfer the solution to a 200-cc. volumetric flask, dilute with water to the 200-cc. mark, mix well, and if not clear, filter through a dry filter into a dry flask. Transfer an accurately measured aliquot of the solution, equivalent to about 300 mg. of diphenylhydantoin sodium, to a separator, add water to make about 50 cc., then add 10 cc. of diluted hydrochloric acid. Shake out the precipitated diphenylhydantoin with 100 cc. of absolute ether, then with four successive portions of 25 cc. each of absolute ether. Evaporate the combined ether extracts, and dry to constant weight at 100°. The weight of the residue of diphenylhydantoin so obtained, multiplied by 1.087, represents the weight of $C_{15}H_{11}N_2O_2Na$ in the aliquot taken for the assay.

Packaging and storage—Preserve Diphenylhydantoin Sodium Capsules in tight containers.

Sizes—Diphenylhydantoin Sodium Capsules usually available contain the following amounts of *diphenylhydantoin sodium: 30 and 100 mg. (½ and 1½ grains).*

AVERAGE DOSE OF DIPHENYLHYDANTOIN SODIUM—**0.1 Gm.** (approximately 1½ grains).

Diphtheria and Tetanus Toxoids

DIPHTHERIA AND TETANUS TOXOIDS

Toxoida Diphtherica et Tetanica

Toxoid. Diphtheric. et Tetan.—Combined Diphtheria and Tetanus Toxoids

Diphtheria and Tetanus Toxoids is a clear or slightly turbid, yellowish or brownish liquid made by mixing suitable quantities of diphtheria toxoid and tetanus toxoid, each of which possesses adequate potency to permit combining. The toxoids shall be mixed in such proportions that each cc., or less, of the combined toxoids will contain one individual human dose of each of the active ingredients. Diphtheria and Tetanus Toxoids complies with the requirements of the National Institute of Health of the United States Public Health Service.

Regulations—The outside label must bear the manufacturer's lot number of the combined toxoids, the name, address, and license number of the manufacturer, and the date beyond which the Toxoids may not be expected to retain the potency required by the National Institute of Health of the United States Public Health Service.

Packaging and storage—Preserve Diphtheria and Tetanus Toxoids at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, **1 cc.**, to be repeated twice with intervals of approximately 3 weeks between injections. Additional doses may be required to secure a negative Schick test.

Diphtheria and Tetanus Toxoids, Alum Precipitated

ALUM PRECIPITATED DIPHTHERIA AND TETANUS TOXOIDS

Toxoida Diphtherica et Tetanica Alumen-præcipitata

Toxoid. Diphtheric. et Tetan. Alumen-præcip.—Combined Diphtheria and Tetanus Toxoids, Alum Precipitated

Alum Precipitated Diphtheria and Tetanus Toxoids is a turbid, white, slightly gray or slightly pink suspension prepared by mixing suitable

quantities of alum precipitated diphtheria toxoid and alum precipitated tetanus toxoid, each of which possesses adequate potency to permit combining. The toxoids shall be mixed in such proportions that each cc., or less, of the combined toxoids will contain one individual human dose of each of the active ingredients. Alum Precipitated Diphtheria and Tetanus Toxoids complies with the requirements of the National Institute of Health of the United States Public Health Service.

Regulations—The outside label must bear the manufacturer's lot number of the combined toxoids, the name, address, and license number of the manufacturer, and the date beyond which the Toxoids may not be expected to retain the potency required by the National Institute of Health of the United States Public Health Service.

Packaging and storage—Preserve Alum Precipitated Diphtheria and Tetanus Toxoids at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, **1 cc.**, to be repeated once with an interval of four to six weeks. Additional doses may be required to secure a negative Schick test.

Diphtheria Antitoxin

DIPHTHERIA ANTITOXIN

Antitoxinum Diphthericum

Antitox. Diphtheric.

Diphtheria Antitoxin is a sterile solution of antitoxic substances obtained from the blood serum or plasma of a healthy animal which has been immunized against diphtheria toxin. Diphtheria Antitoxin has a potency of not less than 500 antitoxic units per cc. Diphtheria Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Diphtheria Antitoxin is a transparent or slightly opalescent liquid of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight, granular deposit. Diphtheria Antitoxin must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used), and its total solids must not exceed 20 per cent.

Regulations—The potency of the Antitoxin shall be expressed in antitoxic units, and the unit shall be that of the standard Diphtheria Antitoxin distributed by the National Institute of Health of the United States Public Health Service.

The outside label must bear the name *Diphtheria Antitoxin* and indicate the minimum number of antitoxic units in the package, the manufacturer's lot number of the Antitoxin, the name, address, and the license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the minimum potency of the contents, as declared on the label, may not be maintained. This date is 1 year from the date of issue from the manufacturing establishment if at the time the Antitoxin was placed in the container it had an excess of 20 per cent over the declared minimum potency, 2 years for a 30 per cent excess, 3 years for a 40 per cent excess, or 4 years for a 50 per cent excess.

Packaging and storage—Preserve Diphtheria Antitoxin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 20,000 units; prophylactic, 1000 units.

Diphtheria Toxin, Diagnostic

DIAGNOSTIC DIPHTHERIA TOXIN

Toxinum Diphthericum Diagnosticum

Toxin. Diphtheric. Diagnost.

Schick Test Toxin—Diphtheria Toxin for the Schick Test*

Diagnostic Diphtheria Toxin is a sterile solution of the toxic products of growth of the diphtheria bacillus (*Corynebacterium diphtheriæ*). Diagnostic Diphtheria Toxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Diagnostic Diphtheria Toxin is a transparent liquid containing one-fiftieth of the minimum lethal dose of diphtheria toxin in 0.1 cc. It may be supplied as diluted toxin ready for administration mixed with a suitable stabilizing diluent or as undiluted toxin accompanied by a vial of diluent suitable for preparing a toxin of the required strength at the time of administration. The minimum lethal dose of Diagnostic Diphtheria Toxin is defined as the smallest amount of toxin which, administered subcutaneously to a 250- to 280-Gm. guinea pig, will cause the death of the animal within 96 hours after administration. Diagnostic Diphtheria Toxin must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name Diphtheria Toxin for the Schick Test, the manufacturer's lot number of the Toxin, the name, address, and license number of the manufacturer, and the date beyond which the Toxin may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Diagnostic Diphtheria Toxin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intracutaneous, for determining susceptibility (Schick Test), **0.1 cc.** of the dilution, representing one-fiftieth of the minimum lethal dose.

Diphtheria Toxoid

DIPHTHERIA TOXOID

Toxoidum Diphthericum

Toxoid. Diphtheric.—Diphtheria Anatoxin, Anatoxin-Ramon

Diphtheria Toxoid is a sterile solution of the products of growth of the diphtheria bacillus (*Corynebacterium diphtheriæ*) so modified by special treatment as to have lost the ability to cause toxic effects in guinea pigs but retaining the property of inducing active immunity. The toxicity of the Diphtheria Toxoid shall be so low that five times the initial dose for the adult human does not cause either local or general symptoms of diphtheria poisoning in a guinea pig within 30 days after its injection into the animal. The antigenic value shall be such that the initial dose for the human shall protect at least 80 per cent of guinea pigs, 6 weeks after injection, against five minimum lethal doses each of diphtheria test toxin. Diphtheria Toxoid complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Diphtheria Toxoid is a clear, brownish yellow, or slightly turbid liquid having a faint, broth-like odor or an odor due to the presence of a preservative. All specimens not alum precipitated must be clear. Diphtheria Toxoid must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Diphtheria Toxoid*, the manufacturer's lot number of the Toxoid, the name, address, and license number of the manufacturer, and the date beyond which the Toxoid may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Diphtheria Toxoid at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, **1 cc.** or **0.5 cc.** (whichever is specified on the label) to be repeated twice at intervals of approximately 3 weeks between injections.

Diphtheria Toxoid, Alum Precipitated

ALUM PRECIPITATED DIPHTHERIA TOXOID

Toxoidum Diphthericum Alumen-præcipitatum

Toxoid. Diphtheric. Alumen-præcip.

Alum Precipitated Diphtheria Toxoid is a sterile suspension of diphtheria toxoid precipitated with alum from the solution in which the products of growth of the diphtheria bacillus (*Corynebacterium diphtheriæ*) have developed and have been so modified by special treatment as to have lost the ability to cause toxic effects in guinea pigs but retain the property of inducing active immunity.

Alum Precipitated Diphtheria Toxoid complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Alum Precipitated Diphtheria Toxoid is a turbid, white, slightly gray, or slightly pink suspension prepared by adding a sterile solution of alum to diphtheria toxoid, washing the resultant precipitate with isotonic sodium chloride solution, and resuspending it in isotonic sodium chloride solution to which a suitable preservative may be added.

The antigenic value of Alum Precipitated Diphtheria Toxoid shall be such that the initial dose for the human, when administered subcutaneously to guinea pigs weighing approximately 500 Gm., shall produce at least 2 units of antitoxin per cc. of blood serum at the end of 4 weeks.

The finished product shall contain not more than 20 mg. of alum per individual human injection, the calculation being based on the total amount of alum added for precipitation, or not more than 15 mg. of alum per individual human injection as determined by assay of the finished product.

Regulations—The outside label must bear the name *Alum Precipitated Diphtheria Toxoid*, the manufacturer's lot number of the Toxoid, the name, address, and license number of the manufacturer, and the date beyond which the Toxoid may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Alum Precipitated Diphtheria Toxoid at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, **1 cc.** or **0.5 cc.** (whichever is specified on the label) to be repeated once with an interval of 4 to 6 weeks.

Effervescent Powders, Compound

COMPOUND EFFERVESCENT POWDERS

Pulveres Effervescentes Compositi

Pulv. Eff. Co.—Seidlitz Powders

The mixture in a blue paper weighs not less than 9.5 Gm. and not more than 10.5 Gm., and contains not less than 23 per cent and not more than 27 per cent of sodium bicarbonate, and not less than 73 per cent and not more than 78 per cent of potassium sodium tartrate ($KNaC_4H_4O_6.4H_2O$). The white paper contains not less than 2 Gm. and not more than 2.4 Gm. of tartaric acid.

Sodium Bicarbonate, dry and all passing through a No. 60 standard mesh sieve	30 Gm.
Potassium Sodium Tartrate, dry and all passing through a No. 40 standard mesh sieve	90 Gm.
Tartaric Acid, dry and all passing through a No. 40 standard mesh sieve	26 Gm.

Mix the sodium bicarbonate intimately with the potassium sodium tartrate, divide the mixture into 12 equal parts, and wrap each part in a blue paper. Divide the tartaric acid into 12 equal parts, and wrap each part in a white paper.

Identification—To 5 cc. of a solution of the mixture in a blue paper (1 in 20) add 5 cc of acetic acid, and when effervescence has ceased, shake the solution vigorously: a white, crystalline precipitate, soluble in ammonia T.S., separates.

Assay for sodium bicarbonate—Mix thoroughly the contents of a blue paper, then dissolve 2 Gm. of it in 80 cc. of water, add 20 cc. of half-normal sulfuric acid, boil the solution until its volume is reduced to about 50 cc., and titrate the excess of acid with half-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of half-normal sulfuric acid is equivalent to 42.01 mg. of sodium bicarbonate.

Assay for potassium sodium tartrate—Proceed as directed under *Alkali Salts of Organic Acids*, page 617, using 2 Gm. of the contents of the same blue paper as that from which the material for the preceding assay was taken. The difference between the number of cc. of half-normal sulfuric acid consumed in this assay and the number of cc. consumed in the *Assay for sodium bicarbonate*, multiplied by 0 07056, indicates the number of Gm. of potassium sodium tartrate contained in the 2 Gm. assayed. The sum of the percentages of sodium bicarbonate and of the potassium sodium tartrate, determined by the above assays, is not less than 99 per cent.

Assay for tartaric acid—Proceed as directed for the *Assay* under *Tartaric Acid*, page 555, using the entire contents of one white paper.
Packaging and storage—Preserve Compound Effervescent Powders in well-closed containers, in a dry place.

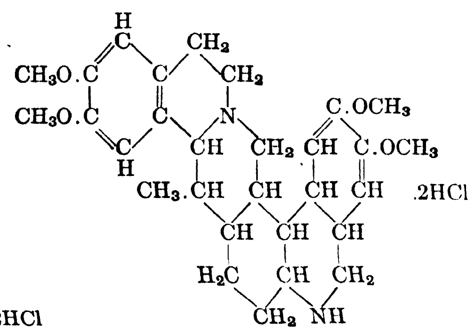
AVERAGE DOSE—The contents of a white and of a blue paper, each dissolved in about 60 cc. (2 fluidounces) of water, the solutions mixed, and administered just after the effervescence begins to subside.

Emetine Hydrochloride

EMETINE HYDROCHLORIDE

Emetinæ Hydrochloridum

Emet. Hydrochlor.



$C_{29}H_{40}N_2O_4.2HCl$ Mol. wt. 553.56

Emetine Hydrochloride is a hydrated hydrochloride of an alkaloid obtained from ipecac or prepared synthetically by methylation of cephaëline.

Description—Emetine Hydrochloride is a white or very slightly yellowish, odorless, crystalline powder. It is affected by light.
Solubility—Emetine Hydrochloride is freely soluble in water and in alcohol.
Identification—
A: Solutions of Emetine Hydrochloride (1 in 100) yield precipitates with iodine T.S., with mercuric-potassium iodide T.S., and with platinic chloride T.S.
B: Sulfuric acid, containing in each cc. about 5 mg. of molybdenum trioxide, produces a bright green mixture with Emetine Hydrochloride.

C: Silver nitrate T.S. produces in a solution of Emetine Hydrochloride (1 in 20) a white precipitate insoluble in nitric acid.

Residue on ignition—The residue on ignition from 200 mg. of Emetine Hydrochloride is negligible, page 685.

Loss on drying—When dried to constant weight at 100°, Emetine Hydrochloride loses not less than 8 per cent and not more than 14 per cent of its weight.

Readily carbonizable substances—Dissolve 100 mg. of Emetine Hydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid H, page 680.

Free acid—A solution of 100 mg. of Emetine Hydrochloride in 10 cc. of water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Cephaëline—Dissolve 200 mg. of Emetine Hydrochloride in 10 cc. of water, add 5 cc. of sodium hydroxide T.S.; extract successively with five 10-cc. portions of ether, and discard the ether extract. Acidify the liquid with diluted sulfuric acid, then add ammonia T.S. to a distinct alkaline reaction, and extract with four successive 10-cc. portions of ether. Evaporate the combined ether solutions to dryness on a water bath and dry the residue at 100° for 1 hour: the weight of the residue does not exceed 4 mg.

Packaging and storage—Preserve Emetine Hydrochloride in tight, light-resistant containers.

AVERAGE DAILY DOSE—Intramuscular, **60 mg.** (approximately 1 grain).

Emetine Hydrochloride Injection

EMETINE HYDROCHLORIDE INJECTION

Injectio Emetinæ Hydrochloridi

Inj. Emet. Hydrochlor.

Emetine Hydrochloride Injection is a sterile solution of emetine hydrochloride in water for injection. It contains an amount of anhydrous emetine hydrochloride ($C_{29}H_{40}N_2O_4.2HCl$) equivalent to not less than 84 per cent and not more than 94 per cent of the labeled amount of emetine hydrochloride. It meets the requirements of the *Sterility Test for Liquids*, page 689.

In preparing the Injection, adjust it with hydrochloric acid or with sodium carbonate or sodium hydroxide to a pH of about 3.5.

Sterilize Emetine Hydrochloride Injection preferably by Process D-1 or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Evaporate 1 cc. of the Injection to dryness on a steam bath. The residue responds to *Identification test B* under *Emetine Hydrochloride*, page 190. The Injection also responds to *Identification tests A* and *C* under *Emetine Hydrochloride*, page 190.

Assay—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, with water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to

about 120 mg. of emetine hydrochloride, to a separator or to a continuous extraction apparatus. Render the solution strongly alkaline with ammonia T.S., and extract the alkaloid completely with ether until 0.5 cc. of the water layer, slightly acidified with hydrochloric acid, remains unaffected by the addition of a few drops of mercuric potassium iodide T.S. Evaporate the combined ether extracts on a water bath, allowing the last few cc. of the ether to evaporate spontaneously. Add to the residue 2 cc. of neutralized alcohol and exactly 30 cc. of fiftieth-normal sulfuric acid, and warm gently until the alkaloid is dissolved. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 5.536 mg. of $C_{29}H_{40}N_2O_4.2HCl$.

Packaging and storage—Preserve Emetine Hydrochloride Injection preferably in single-dose, hermetic containers or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Emetine Hydrochloride Injection usually available contains the following amounts of emetine hydrochloride: 20 mg. (1/3 grain) in 1 cc.; 30 mg. (1/2 grain) in 1 cc.; 60 mg. (1 grain) in 1 cc.

AVERAGE DAILY DOSE OF EMETINE HYDROCHLORIDE—Intramuscular, **60 mg.** (approximately 1 grain).

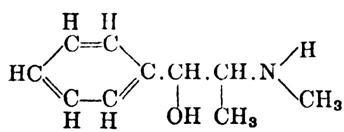
Ephedrine

EPHEDRINE

Ephedrina

Ephedrin.

$C_{10}H_{15}NO$



Mol. wt. 165.23

Ephedrine is an alkaloid obtained from *Ephedra equisetina* Bunge, *Ephedra sinica* Stapf, and other species of *Ephedra* (Fam. *Gnetaceæ*), or produced synthetically. It is anhydrous, or contains not more than one-half molecule of water of hydration.

Anhydrous Ephedrine contains not less than 98.5 per cent of $C_{10}H_{15}NO$. Hydrated Ephedrine contains not less than 94 per cent of $C_{10}H_{15}NO$.

Description—Ephedrine occurs as an unctuous, almost colorless solid, or white crystals or granules. It gradually decomposes on exposure to light. It melts between 33° and 40°, the variability in the melting point being due to differences in the moisture content, anhydrous Ephedrine having a lower melting point than the hemi-hydrate of Ephedrine. Its solution is strongly alkaline to litmus.

Solubility—Ephedrine is soluble in water, in alcohol, in chloroform, and in ether, and is moderately and slowly soluble in liquid petrolatum, the solution in the latter becoming turbid if the Ephedrine contains more than about 1 per cent of water.
Specific rotation—Dissolve 500 mg. of Ephedrine in 10 cc. of ether in a tared beaker, add 0.5 cc. of hydrochloric acid, evaporate to dryness, and dry the residue to constant weight in a desiccator over sulfuric acid. Dissolve 500 mg., accurately weighed, of the ephedrine hydrochloride so obtained in sufficient water to make exactly 10 cc. of solution and determine the rotation in a 100-mm. tube: the specific rotation, $[\alpha]^{25}_{D}$, is not less than $-33°$ and not more than $-35.5°$, page 675.
Identification—
A: Dissolve 10 mg. of Ephedrine in 1 cc. of water with the aid of 1 or 2 drops of diluted hydrochloric acid, and add 0.1 cc. of cupric sulfate T.S. followed by 1 cc. of sodium hydroxide solution (1 in 5): a reddish purple color develops. To the mixture add 1 cc. of ether and shake well: the ether layer is purple and the water layer is blue.
B: Dissolve 50 mg. of Ephedrine in 10 cc. of chloroform, allow the solution to stand over night in a closely covered vessel, and then evaporate it spontaneously: white crystals of ephedrine hydrochloride appear, which, when dissolved in water, respond to the identity tests for *Chloride*, page 659.
Residue on ignition—Ephedrine yields not more than 0.1 per cent of residue on ignition, page 685.
Chloride—A solution of 500 mg. of Ephedrine shows no more *Chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 709.
Sulfate—Dissolve 100 mg. of Ephedrine in 40 cc. of water, and add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity develops within 10 minutes.
Assay—Dissolve about 500 mg. of Ephedrine, accurately weighed without previous drying, in 10 cc. of neutralized alcohol, add 5 drops of methyl red T.S., and an excess of tenth-normal hydrochloric acid, accurately measured. Titrate the excess of acid with tenth-normal sodium hydroxide. Each cc. of tenth-normal hydrochloric acid is equivalent to 16.52 mg. of $C_{10}H_{15}NO$.
Labeling—The label shall declare whether the Ephedrine is hydrated or anhydrous. When the quantity of Ephedrine is indicated in the labeling of any preparation of Ephedrine, this shall be understood to be in terms of anhydrous Ephedrine.
Packaging and storage—Preserve Ephedrine in tight, light-resistant containers, in a cold place.

Ephedrine Hydrochloride

EPHEDRINE HYDROCHLORIDE

Ephedrinae Hydrochloridum

Ephedrin. Hydrochlor.

$C_{10}H_{15}NO\ HCl$ Mol. wt. 201.69

Ephedrine Hydrochloride, when dried at 100° for 3 hours, contains not less than 80.4 per cent and not more than 82.5 per cent of anhydrous ephedrine ($C_{10}H_{15}NO$), corresponding to not less than 98 per cent of $C_{10}H_{15}NO.HCl$.

Description—Ephedrine Hydrochloride occurs as fine, white, odorless crystals or powder. It is affected by light.
Solubility—One Gm. of Ephedrine Hydrochloride dissolves in about 3 cc. of water and in about 14 cc. of alcohol. It is insoluble in ether.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Ephedrine Hydrochloride, determined in a solution containing 500 mg. of the salt, previously dried at 100° for 3 hours, in each 10 cc., and using a 100 mm. tube, is not less than −33° and not more than −35.5°, page 675.

Identification—

A: Ephedrine Hydrochloride responds to *Identification test A* under *Ephedrine Sulfate*, page 194.

B: A solution of Ephedrine Hydrochloride responds to the tests for *Chloride*, page 659.

Free acid or free base—Dissolve 1 Gm. of Ephedrine Hydrochloride in 20 cc. of water and add 1 drop of methyl red T.S. If the solution is yellow, it is changed to red by not more than 0.1 cc. of fiftieth-normal sulfuric acid. If the solution is pink, it is changed to yellow by not more than 0.2 cc. of fiftieth-normal sodium hydroxide.

Loss on drying—Dry about 500 mg. of Ephedrine Hydrochloride, accurately weighed, at 100° for 3 hours: the loss in weight does not exceed 2 per cent.

Residue on ignition—Ephedrine Hydrochloride yields not more than 0.1 per cent of residue on ignition, page 685.

Sulfate—Dissolve 50 mg. of Ephedrine Hydrochloride in 40 cc. of water, and add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity develops within 10 minutes.

Assay—Proceed as directed under *Ephedrine Sulfate*, page 194, using about 300 mg. of Ephedrine Hydrochloride, dried at 100° for 3 hours and accurately weighed. Each cc. of tenth-normal sulfuric acid is equivalent to 16.52 mg. of $C_{10}H_{15}NO$.

Packaging and storage—Preserve Ephedrine Hydrochloride in well-closed, light-resistant containers.

AVERAGE DOSE—**25 mg.** (approximately 3/8 grain).

Ephedrine Sulfate

EPHEDRINE SULFATE

Ephedrinæ Sulfas

Ephedrin. Sulf.

$(C_{10}H_{15}NO)_2.H_2SO_4$ Mol. wt. 428.53

Ephedrine Sulfate, when dried at 100° for 3 hours, contains not less than 75.5 per cent and not more than 77.3 per cent of anhydrous ephedrine ($C_{10}H_{15}NO$), corresponding to not less than 98 per cent of $(C_{10}H_{15}NO)_2.H_2SO_4$.

Description—Ephedrine Sulfate occurs as fine, white, odorless crystals or as a powder. It is affected by light.

Solubility—Ephedrine Sulfate is freely soluble in water and in hot alcohol. It is less soluble in cold alcohol.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Ephedrine Sulfate, determined in a solution containing 500 mg. of the salt, previously dried at 100° for 3 hours, in each 10 cc., and using a 100-mm. tube, is not less than −29.5° and not more than −32.0°, page 675.

Identification—

A: Dissolve 10 mg. of Ephedrine Sulfate in 1 cc. of water, and add 0.1 cc. of cupric sulfate T.S., followed by 1 cc. of sodium hydroxide solution (1 in 5): a reddish purple color develops. To the mixture add 1 cc. of ether, and shake well: the ether layer becomes purple and the water layer blue.

B: A solution of Ephedrine Sulfate in water responds to the tests for *Sulfate*, page 663.

Free acid or free base—Dissolve 1 Gm. of Ephedrine Sulfate in 20 cc. of water and add 1 drop of methyl red T.S. If the solution is yellow, it is changed to red by not more than 0.1 cc. of fiftieth-normal sulfuric acid. If the solution is pink, it is changed to yellow by not more than 0.2 cc. of fiftieth-normal sodium hydroxide.

Loss on drying—Dry about 500 mg. of Ephedrine Sulfate accurately weighed at 100° for 3 hours: the loss in weight does not exceed 2 per cent.

Residue on ignition—Ephedrine Sulfate yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—A 200-mg. portion of Ephedrine Sulfate shows no more *Chloride* than corresponds to 0.4 cc. of fiftieth-normal hydrochloric acid, page 709.

Assay—Weigh accurately about 400 mg. of Ephedrine Sulfate, previously dried at 100° for 3 hours, and transfer it to a separator containing 10 cc. of water saturated with sodium chloride. Add 5 cc. of normal sodium hydroxide, and extract first with 20 cc. of ether, then with six successive 10-cc. portions of ether, collecting the ether extracts in a second separator. Wash the combined ether extracts with two successive 5-cc. portions of water saturated with sodium chloride, and transfer the water to another separator. Shake the wash water with 10 cc. of ether, add this ether to the ether extract in the second separator, and discard the wash water. Extract the ether solution first with 25 cc. of tenth-normal sulfuric acid, accurately measured, then successively with 10 cc. and 5 cc. of water. Combine the sulfuric acid and water extracts in a beaker, and warm on a water bath until the odor of ether is no longer perceptible. Cool the solution, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 16.52 mg. of $C_{10}H_{15}NO$.

Packaging and Storage—Preserve Ephedrine Sulfate in well-closed, light-resistant containers.

AVERAGE DOSE—**25 mg.** (approximately 3/8 grain).

Ephedrine Sulfate Tablets

EPHEDRINE SULFATE TABLETS

Tabellæ Ephedrinæ Sulfatis

Tab. Ephedrin. Sulf.

Ephedrine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $(C_{10}H_{15}NO)_2.H_2SO_4$.

Identification—Triturate a quantity of finely powdered Ephedrine Sulfate Tablets, equivalent to about 200 mg. of ephedrine sulfate, with two 5-cc. portions of chloroform, and discard the chloroform. Macerate the residue with 15 cc. of warm alcohol for 20 minutes, filter, and evaporate the filtrate to dryness on a steam bath. The residue of ephedrine sulfate so obtained responds to *Identification tests A* and *B* under *Ephedrine Sulfate*, page 194.

Assay—Weigh a counted number of not less than 20 Ephedrine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 100 mg. of ephedrine sulfate, and macerate it with 10 cc. of water and 1 cc. of normal sulfuric acid for 2 hours. Decant the liquid through a small filter into a beaker. Macerate the residue with 5 cc. of water for 20 minutes, filter through the same filter, and wash the residue and filter with small portions of water. Evaporate the combined filtrate and washings to about 7 cc., and transfer the solution completely to a separator with the aid of a few cc. of water. Saturate the solution with sodium chloride, then add 5 cc. of normal sodium hydroxide, and extract with 25 cc. of ether. Draw off the water layer into another separator, and repeat the extraction of the water layer in a similar manner several times, using 10 cc. of ether each time until the alkaloid is completely extracted. Wash the combined ether extracts with two 5-cc. portions of water, saturated with sodium chloride, then extract the water with 10 cc. of ether, and add this ether to the main ether extract. Evaporate the combined ether extracts at a temperature not exceeding 30° to about 10 cc., add exactly 40 cc. of fiftieth-normal sulfuric acid, and heat gently on a steam bath to dissolve all of the alkaloid and dispel the remainder of the ether. Cool, and titrate the excess of sulfuric acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 4.285 mg. of $(C_{10}H_{15}NO)_2.H_2SO_4$.
Packaging and storage—Preserve Ephedrine Sulfate Tablets in well-closed containers.
Sizes—Ephedrine Sulfate Tablets usually available contain the following amounts of ephedrine sulfate: 15, 25, 30 and 45 mg. (¼, ⅜, ½, and ¾ grain).

AVERAGE DOSE OF EPHEDRINE SULFATE—25 mg. (approximately ⅜ grain).

PAGE
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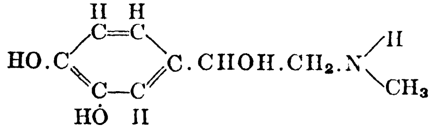
Epinephrine

EPINEPHRINE

Epinephrina

Epineph.



$C_9H_{13}O_3N$ Mol. wt. 183.20

Description—Epinephrine occurs as a white or light brownish, microcrystalline, odorless powder, gradually darkening on exposure to air. It combines with acids, forming salts which are readily soluble in water, and from these solutions the base may be precipitated by ammonia water or by alkali carbonates. Its solutions are slightly alkaline to litmus. It is affected by light.
Solubility—Epinephrine is very slightly soluble in water and in alcohol. It is insoluble in ether, in chloroform, and in fixed and volatile oils.
Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Epinephrine, determined in a solution obtained by dissolving 1 Gm. of Epinephrine, previously dried over sulfuric acid to constant weight, in sufficient half-normal hydrochloric acid to make 20 cc. at 25°, and using a 200-mm. tube, is not less than −50° and not more than −53.5°, page 675.

Identification—A slightly acid solution of Epinephrine (1 in 1000) treated with ferric chloride T.S. has an emerald green color which changes to cherry red and finally to brown on standing. Other oxidizing agents produce red, pink, or violet colors which change to brown.

Loss on drying—When dried in a vacuum over sulfuric acid for 18 hours, Epinephrine loses not more than 2 per cent of its weight.

Residue on ignition—The residue on ignition from 100 mg. of Epinephrine is negligible, page 685.

Plant alkaloids—An acid solution of Epinephrine (1 in 1000) is not visibly affected by solutions of trinitrophenol, tannic acid, phosphomolybdic acid, mercuric-potassium iodide, or platinic chloride.

Packaging and storage—Preserve Epinephrine in tight, light-resistant containers.

EPINEPHRINE INHALATION

Inhalatio Epinephrinæ

Inhal. Epineph.—Epinephrine Solution 1:100; Epinephrine Hydrochloride Spray U. S. P. XII

Epinephrine Inhalation is a solution of epinephrine in distilled water prepared with the aid of hydrochloric acid. It has a potency equivalent to a solution containing 1 Gm. of U. S. P. Epinephrine Reference Standard in each 100 cc.

Epinephrine Inhalation conforms to the *Description* and *Identification test* under Epinephrine Solution, page 198.

Assay—

Standard solution of epinephrine—Prepare a standard solution of epinephrine from the U. S. P. Epinephrine Reference Standard by the following procedure: Dissolve 50 mg. of the Reference Standard, previously dried in a vacuum desiccator over sulfuric acid for 18 hours, in 5 cc. of tenth-normal hydrochloric acid, and dilute to 50 cc. by the addition of water, thus making a 1 in 1000 solution. Preserve this solution in a tightly-stoppered, hard-glass container, and store under refrigeration and protected from light, except when in use. This solution must not be used if it shows any evidence of deterioration, such as change in color, or if it has been prepared for more than 6 months.

Preparation of the test dilutions—On the day of the assay, prepare a test dilution of the Standard Solution of Epinephrine, using sufficient isotonic sodium chloride solution, so that upon injection into the animal prepared for the assay as described on page 199, a dose of not less than 0.5 cc. and not more than 1.5 cc. will be required to produce a rise in blood pressure equivalent to 30 to 60 mm. of mercury. Prepare a similar test dilution of the Epinephrine Inhalation to be assayed, using a 0.9 per cent solution of sodium chloride in ten-thousandth normal hydrochloric acid, prepared by diluting 1 cc. of tenth-normal hydrochloric acid to 1000 cc. with isotonic sodium chloride solution. Discard any test dilutions in which a trace of pink color has developed.

From this point proceed with the assay under *Epinephrine Solution*, page 198, beginning with the words "Preparation of the animal."

NOTE—Evidence of potency within 5 per cent below or 5 per cent above the standard is acceptable.

Packaging and storage—Preserve Epinephrine Inhalation in small, well-filled, light-resistant, tight containers.

Epinephrine Injection

EPINEPHRINE INJECTION

Injectio Epinephrinæ

Inj. Epineph.—Epinephrine Hydrochloride Injection U. S. P. XII

Epinephrine Injection is a sterile solution of epinephrine in water for injection prepared with the aid of hydrochloric acid. Its potency shall be stated on the label of the container in terms of the quantity of U. S. P. Epinephrine Reference Standard to which it is equivalent. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Epinephrine Injection preferably by Process D-1 or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—The Injection responds to the *Identification test* under *Epinephrine Solution*, page 198.

Assay—Proceed as directed under *Epinephrine Solution*, page 198.

NOTE—Evidence of potency within 5 per cent below or 5 per cent above the standard is acceptable.

Packaging and storage—Preserve Epinephrine Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light.

Sizes—Epinephrine Injection is usually available containing the following amounts of epinephrine: 1 cc. of 1–1000 solution; 10 cc. of 1–1000 solution; 30 cc. of 1–1000 solution.

AVERAGE DOSE OF EPINEPHRINE—Subcutaneous or intramuscular, **1 mg.** (approximately $\frac{1}{60}$ grain).

Epinephrine Solution

EPINEPHRINE SOLUTION

Liquor Epinephrinæ

Liq. Epineph.—Epinephrine Solution 1:1000; Solution of Epinephrine Hydrochloride U. S. P. XII

Epinephrine Solution is a solution of epinephrine in distilled water prepared with the aid of hydrochloric acid. It has a potency equivalent to a solution containing 1 Gm. of U. S. P. Epinephrine Reference Standard in each 1000 cc.

Description—Epinephrine Solution is a nearly colorless, slightly acid liquid, gradually turning dark on exposure to air and light.

If the solution is brown in color, or contains a precipitate, it must not be used.

Identification—The addition of 1 drop of ferric chloride T.S. to 10 cc. of Epinephrine Solution produces an emerald green color, which soon changes to cherry red and finally to brown.

Assay—

Standard solution of epinephrine—Dissolve 50 mg. of U. S. P. Epinephrine Reference Standard, previously dried in a vacuum desiccator over sulfuric acid for 18 hours, in 5 cc. of tenth-normal hydrochloric acid and dilute to 50 cc. with water to make a 1 in 1000 solution. Preserve this solution in a tightly-stoppered, hard-glass container, and, except when in use, store under refrigeration and protected from light. This solution must not be used if it shows any evidence of deterioration, such as change in color, or if it has been prepared for more than 6 months.

Preparation of the test dilutions—On the day of the assay, prepare test dilutions of both the Standard solution of epinephrine and of the Epinephrine Solution to be assayed, using sufficient isotonic sodium chloride solution so that, upon injection into the animal prepared for the assay as described below, a dose of not less than 0.5 cc. and not more than 1.5 cc. will be required to produce a rise in blood pressure equivalent to 30 to 60 mm. of mercury. Discard any test dilution in which a trace of pink color has developed.

Preparation of the animal—Using an anesthetic substance suitable for maintenance of a uniform level of blood pressure, anesthetize a dog of medium size deeply enough to prevent the occurrence of muscular movements such as shivering or twitching. At room temperatures below 25°, protect the animal from excess loss of body heat by covering it, or by the application of artificial heat. If preferable or necessary, expose the trachea and insert a cannula so that the animal may receive artificial respiration during the course of the assay. Insert into a carotid artery a cannula connected to a mercury manometer and arrange to record the blood pressure of the animal upon a kymograph. Expose a femoral vein and inject into it 0.1 cc. per Kg. of the dog's weight of a 1.0 per cent solution of atropine sulfate in water. Consider the vagal receptor mechanism sufficiently paralyzed only if subsequent intravenous injections of 0.1 cc. per Kg. of a 0.01 per cent solution of acetylcholine chloride prepared within 24 hours, in water, fail to elicit any decrease in blood pressure. If the vagal receptor mechanism is insufficiently paralyzed, inject in doses of 0.05 cc. per Kg. the above-designated atropine sulfate solution until the paralysis is complete.

Test of the animal preparation—Test the uniformity of the responses and the sensitivity of the animal by the following procedure, discarding any animal which fails to meet these tests: Select two doses of the test dilution of the standard differing in amount by no more than 20 per cent of the smaller dose and which upon injection cause rises in blood pressure between 30 and 60 mm. of mercury. Make two or more injections of each of these selected doses alternately. Make these and subsequent injections of test dilutions at regular intervals of time which shall be not less than 5 minutes and long enough to allow the blood pressure to return to approximately its former level. Measure the rises in blood pressure to the nearest mm. of mercury. Determine the average rise corresponding to each dosage level and the difference between the two or more responses to the same dosage. Consider the animal preparation satisfactory for purposes of this assay if the difference between the two averages is at least 5 mm. of mercury and at least twice the maximum difference observed in the values making up each average.

Comparison of the test dilutions—At regular intervals, make alternate injections of the test dilutions of the Standard solution of epinephrine and of the Epinephrine Solution to be assayed. Vary the dosage of the latter, if necessary, until the amount is found which, in at least two successive injections, raises the blood pressure between 30 and 60 mm. of mercury and to heights equivalent to those observed following the alternate injections of the Standard solution of epinephrine, indicating that the amount of active agent is the same in the doses used. Consider as equivalent any four successive rises in blood pressure if the difference between the lowest and highest of them does not exceed one-half the difference between the two average rises obtained in standardizing the animal preparation.

From the results thus obtained, calculate the strength of the unknown and adjust as necessary.

NOTE—Evidence of potency within 5 per cent below or 5 per cent above the standard is acceptable.

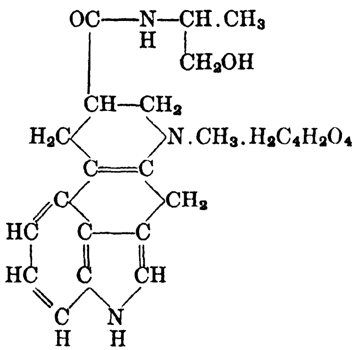
Packaging and storage—Preserve Epinephrine Solution in small, well-filled, light-resistant, tight containers.

Ergonovine Maleate

ERGONOVINE MALEATE

Ergonovinæ Maleas

Ergonov. Mal.—Ergometrine Maleate



$C_{19}H_{23}N_3O_2.C_4H_4O_4$ Mol. wt. 441.47

The maleate of an alkaloid obtained from ergot.

Ergonovine Maleate, when dried over sulfuric acid for 4 hours, contains not less than 98 per cent of $C_{19}H_{23}N_3O_2.C_4H_4O_4$.

Description—Ergonovine Maleate occurs as a white, or faintly yellow, odorless, microcrystalline powder. It is affected by light.

Solubility—One Gm. of Ergonovine Maleate dissolves in about 36 cc. of water, and in about 120 cc. of alcohol. It is insoluble in ether and in chloroform.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Ergonovine Maleate, determined in a solution containing 100 mg. of the salt, previously dried over sulfuric acid for 4 hours, in each 10 cc., and using a 100-mm. tube, is not less than +48° and not more than +57°, page 675.

Identification—

A: A solution of Ergonovine Maleate has a blue fluorescence.

B: Dissolve about 2 mg. of Ergonovine Maleate in 20 cc. of water. To 1 cc. of this solution add 2 cc. of *p*-dimethylaminobenzaldehyde T.S.: after about 10 minutes the mixture exhibits a deep blue color.

Loss on drying—When dried over sulfuric acid for 4 hours, Ergonovine Maleate loses not more than 2 per cent of its weight.

Ergotoxine and ergotamine—When heated to boiling with a solution of sodium hydroxide (1 in 10), Ergonovine Maleate does not evolve ammonia. No precipitate is produced by mercuric potassium iodide T.S. in a solution of Ergonovine Maleate (1 in 10,000).

Assay—Dissolve about 100 mg. of Ergonovine Maleate, previously dried over sulfuric acid for 4 hours and accurately weighed, in 2 cc. of alcohol and 3 cc. of stronger ammonia T.S. in a suitable separator. Add 50 cc. of a saturated solution of sodium chloride, and extract with eight successive 25-cc. portions of ether. Collect the ether extracts in a beaker, and evaporate the ether on a water bath to not more than 2 cc. Add 25 cc. of fiftieth-normal hydrochloric acid, accurately measured, and warm on a water bath to remove any traces of ether and to insure complete solution of the ergonovine. Add 20 cc. of water, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using 5 drops of bromophenol blue T.S. as the indicator, continuing the titration until a purplish blue color appears. Each cc. of fiftieth-normal hydrochloric acid is equivalent to 8.829 mg. of $C_{19}H_{23}N_3O_2.C_4H_4O_4$.

Packaging and storage—Preserve Ergonovine Maleate in tight, light-resistant containers.

AVERAGE DOSE—

Intravenous or intramuscular, **0.2 mg.** (approximately $\frac{1}{300}$ grain).

Oral, **0.5 mg.** (approximately $\frac{1}{120}$ grain).

ERGONOVINE MALEATE INJECTION

Injectio Ergonovinæ Maleatis

Inj. Ergonov. Mal.

Ergonovine Maleate Injection is a sterile solution of ergonovine maleate in water for injection. It contains not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{19}H_{23}N_3O_2.C_4H_4O_4$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Ergonovine Maleate Injection preferably by Process D-1. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—

A: Concentrate a volume of the Injection by evaporation on a water bath so that the resulting solution will contain about 5 mg. of ergonovine maleate in 15 cc.: the concentrated solution has a blue fluorescence.

B: Mix 6 cc. of the concentrated solution obtained in *Identification Test A* with 14 cc. of water. To 1 cc. of this solution add 2 cc. of *p*-dimethylaminobenzaldehyde T.S.: after about 10 minutes the mixture exhibits a deep blue color.

Foreign alkaloids—Dilute 3 cc. of the concentrated solution obtained in *Identification Test A* with 7 cc. of water, and add 1 drop of hydrochloric acid and a few drops of mercuric potassium iodide T.S.: no precipitate or turbidity is produced.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, equivalent to 2 mg. of ergonovine maleate, and dilute to 100 cc. Transfer exactly 2 cc. of this solution to a suitable tube and add 4 cc. of *p*-dimethylaminobenzaldehyde T.S., mix, and allow to stand in subdued light for 1 hour. Perform parallel control tests

with 0.9 cc. and 1.1 cc. of a solution made by dissolving 6.0 mg. of U. S. P. Ergotoxine Ethanesulfonate Reference Standard in 20 cc. of alcohol and sufficient water to make exactly 100 cc. The solution obtained with the Injection, when viewed transversely against a white background, is not lighter in color than the control made with 0.9 cc. and not darker than the control made with 1.1 cc. of the ergotoxine ethanesulfonate solution. The color comparison is preferably made in suitable colorimeters.

Packaging and storage—Preserve Ergonovine Maleate Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light and maintain at a temperature above 0°, but preferably not exceeding 12°.

Labeling—The label for Ergonovine Maleate Injection shall state a date of expiration which must not be later than 2 years after the date of removal for distribution from the manufacturer's place of storage, which shall be maintained at a temperature between 0° and 12°.

Sizes—Ergonovine Maleate Injection usually available contains the following amounts of ergonovine maleate: 0.2 mg. ($\frac{1}{300}$ grain) in 1 cc.; 0.5 mg. ($\frac{1}{120}$ grain) in 1 cc.

AVERAGE DOSE OF ERGONOVINE MALEATE—Intravenous or intramuscular, **0.2 mg.** (approximately $\frac{1}{300}$ grain).

Ergonovine Maleate Tablets

ERGONOVINE MALEATE TABLETS

Tabellæ Ergonovinæ Maleatis

Tab. Ergonov. Mal.

Ergonovine Maleate Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{19}H_{23}N_3O_2.C_4H_4O_4$.

Identification—Triturate well a number of Ergonovine Maleate Tablets, equivalent to about 2 mg. of ergonovine maleate, with 50 cc. of warm water, and filter: the filtrate has a blue fluorescence.

Foreign alkaloids and ergotamine—To 5 cc. of the filtrate prepared in the test for *Identification*, add 1 drop of diluted hydrochloric acid and a few drops of mercuric potassium iodide T.S.: no precipitate or turbidity is produced.

Ergotoxine and ergotamine—To the remainder of the solution obtained in the test for *Identification*, add 1 cc. of ammonia T.S., and extract with three 10-cc. portions of ether. Evaporate the combined ether extract to dryness, add to the residue 1 cc. of water and a few drops of diluted hydrochloric acid, warm until dissolved, and transfer to a test tube. Add to the solution 2 cc. of sodium hydroxide (1 in 10), and boil gently. The odor of ammonia is not evolved.

Assay—Weigh a counted number of not less than 50 Ergonovine Maleate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to 6.66 mg. of ergonovine maleate, transfer it completely with the aid of 20 cc. of alcohol to a 100-cc. volumetric flask, and macerate for 30 minutes, agitating the mixture frequently. Dilute to the 100-cc. mark with water, mix the suspension thoroughly, let stand for 5 minutes, then filter through a dry filter into a dry flask, rejecting the first 10 cc. of the filtrate. Transfer exactly 1.0 cc. of the subsequent filtrate to a suitable tube, and add 1 cc. of water, followed by 4 cc. of *p*-dimethylaminobenzaldehyde T.S., mix, and allow to stand in subdued light for 1 hour. Perform parallel control tests with 0.9 cc. and 1.1 cc. of a solution made by dissolving 10.0 mg. of U. S. P. Ergotoxine Ethane-

sulfonate Reference Standard in 20 cc. of alcohol and sufficient water to make exactly 100 cc. The color of the solution obtained with the Ergonovine Maleate Tablets, when viewed transversely against a white background, is not lighter than the control made with 0.9 cc., and not darker than the control made with 1.1 cc. of the ergotoxine ethanesulfonate solution. The color comparison is preferably made in suitable colorimeters.

Packaging and storage—Preserve Ergonovine Maleate Tablets in well-closed containers.

Sizes—Ergonovine Maleate Tablets usually available contain the following amounts of ergonovine maleate: 0.2 and 0.5 mg. ($\frac{1}{300}$ and $\frac{1}{120}$ grain).

AVERAGE DOSE OF ERGONOVINE MALEATE—**0.5 mg.** (approximately $\frac{1}{120}$ grain).

ERGOTAMINE TARTRATE

Ergotaminæ Tartras

Ergotam. Tart.

$(C_{33}H_{35}N_5O_5)_2 \cdot C_4H_6O_6$ Mol. wt. 1313.39

The tartrate of an alkaloid obtained from ergot.

Description—Ergotamine Tartrate occurs as colorless crystals or as a white, crystalline powder, usually containing solvent of crystallization. These crystals lose the solvent of crystallization in a high vacuum. It melts between 177° and 184° with decomposition.

Solubility—One Gm. of Ergotamine Tartrate dissolves in about 500 cc. of water and in 500 cc. of alcohol.

Specific rotation—Place about 340 mg. of Ergotamine Tartrate, accurately weighed, in a separator, add 25 cc. of water, followed by 500 mg. of sodium bicarbonate, and mix gently. Add 10 cc. of chloroform, shake vigorously, and after the layers have separated draw off the chloroform through a small filter, previously moistened with chloroform, into a 50-cc. volumetric flask. Continue the extraction with successive 10-cc. portions of chloroform, passing the extract through the same filter until nearly 50 cc. of extract have been obtained. Place the flask in a bath at 20° for 10 minutes. Adjust the volume of extract to 50 cc. at 20° by the addition of chloroform. Mix the solution, and determine the angular rotation at 20°, using sodium light. Determine the concentration of ergotamine in the chloroform solution by evaporating an aliquot of the solution to dryness and drying the residue at 100° in a vacuum to constant weight. From the angular rotation of the solution and the concentration of ergotamine base, calculate the specific rotation of the base. The specific rotation, $[\alpha]_D^{20°}$, is not less than $-150°$.

Identification—

A: Dissolve 1 mg. of Ergotamine Tartrate in a mixture of 5 cc. of glacial acetic acid and 5 cc. of ethyl acetate. To 1 cc. of this solution add slowly, with continuous agitation and cooling, 1 cc. of sulfuric acid: a blue color with a red tinge develops. Add 0.1 cc. of ferric chloride T.S., previously diluted with an equal volume of water: the red tinge becomes less apparent and the blue color more pronounced.

B: To **2** cc. of a solution of Ergotamine Tartrate (1 in 10,000) add 0.1 cc. of mercuric-potassium iodide T.S.: a slight turbidity appears.

Foreign substances—In a subdued light transfer 500 mg. of Ergotamine Tartrate to a separator containing 20 cc. of water and 1 cc. of ammonia T.S. Shake the solution with three portions of chloroform (20 cc., 15 cc., and 15 cc.), combine the chloroform extracts, and evaporate spontaneously. Transfer a weighed portion of the residue to a beaker, and add ten times the weight of acetone at 30°. If the solid matter does not dissolve, mark the height of the liquid in the beaker, then add twice the volume of acetone already present, and warm the mixture. If the solid matter still does not dissolve, filter the mixture, reject the residue, and evaporate the filtrate to the volume already marked. Add a volume of water equivalent to 60 per cent of the volume of the acetone solution, and keep at 0° for 2 hours. Filter off the crystals, and wash with 2 cc. of ether: the crystals are rhombic and highly refractive. Dry the crystals over sulfuric acid for 24 hours: the crystals lose their solvent of crystallization and become a lusterless powder which on being heated blackens at 174° and decomposes with evolution of gas at 181° to 182°. The powder is soluble in chloroform and in glacial acetic acid, but is sparingly soluble in alcohol, in benzene, and in ether.

Packaging and storage—Preserve Ergotamine Tartrate in well-closed containers protected from light and heat.

AVERAGE DOSE—Intramuscular, **0.5 mg.** (approximately 1/120 grain).

Oral, **1 mg.** (approximately 1/60 grain).

Ergotamine Tartrate Tablets

ERGOTAMINE TARTRATE TABLETS

Tabellæ Ergotaminæ Tartratis

Tab. Ergotam. Tart.

Ergotamine Tartrate Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $(C_{33}H_{35}N_5O_5)_2 \cdot C_4H_6O_6$.

Identification—

A: One mg. of the residue obtained in the *Assay* responds to *Identification Test A* under *Ergotamine Tartrate*, page 203.

B: Dissolve about 2 mg. of the residue obtained in the *Assay* in 5 cc. of water with the aid of a few drops of diluted hydrochloric acid. Two-cc. portions of the solution yield distinct turbidities with a few drops of trinitrophenol T.S. and with mercuric potassium iodide T.S.

Assay—Weigh a counted number of not less than 20 Ergotamine Tartrate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 30 mg. of ergotamine tartrate, and triturate it in a mortar with 10 cc. of petroleum benzin. Allow to settle, and decant the petroleum benzin through a small filter paper, retaining the powder as completely as possible in the mortar. Re-extract the powder in the same manner with another 10 cc. of petroleum benzin. Discard the petroleum benzin extracts. Add to the residue 15 cc. of chloroform saturated with ammonia (prepared by shaking chloroform with strong ammonia solution, then drawing off the chloroform layer), triturate, and decant through the filter used above. Repeat the extraction with ammoniacal chloroform three times, using 15 cc., 10 cc., and 10 cc., respectively. Transfer the residue to the filter through which the petroleum benzin was filtered, and wash the triturating vessel and the filter with several small portions of the

ammoniacal chloroform, combining these washings with the preceding chloroform extracts. Wash the combined chloroform extracts with 10 cc. of water, then wash the water with 10 cc. of chloroform, adding this chloroform to the main chloroform solution. Evaporate the combined chloroform solutions nearly to dryness at a low temperature, preferably with the aid of a current of air, then add 3 cc. of alcohol, and evaporate to dryness. Re-evaporate with 3 cc. of alcohol, and dry the residue in a vacuum over sulfuric acid for 18 hours, and weigh. The weight of the ergotamine so obtained, multiplied by 1.129, represents the weight of $(C_{33}H_{35}N_5O_5)_2.C_4H_6O_6$ in the portion of the powdered Tablets taken for the assay.

Packaging and storage—Preserve Ergotamine Tartrate Tablets in well-closed containers.

Sizes—Ergotamine Tartrate Tablets usually available contain the following amounts of ergotamine tartrate: 0.5 and 1 mg. ($\frac{1}{120}$ and $\frac{1}{60}$ grain).

AVERAGE DOSE OF ERGOTAMINE TARTRATE—1 mg. (approximately $\frac{1}{60}$ grain).

Erythrityl Tetranitrate Tablets

ERYTHRITYL TETRANITRATE TABLETS

Tabellæ Erythritylis Tetranitratis

Tab. Erythrit. Tetranit.—Erythrol Tetranitrate Tablets, Tetranitrol Tablets

Erythrityl Tetranitrate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of erythrityl tetranitrate $[C_4H_6(NO_3)_4]$.

Solubility—Erythrityl Tetranitrate Tablets are partially soluble in alcohol and in ether (*erythrityl tetranitrate*), and are partially soluble in water (*lactose*).

Identification—

A: The residue obtained in the *Assay* melts between 60° and 61°.

Caution—The erythrityl tetranitrate used in this test may explode on percussion. The operator must be protected by a glass screen while determining the melting point.

B: Dissolve about 10 mg. of the residue obtained in the *Assay* in 1 cc. of water and 2 cc. of sulfuric acid, cool, and overlay with 3 cc. of ferrous sulfate T.S.: a brown color is produced at the zone of contact of the two liquids.

Assay—Weigh accurately a counted number of not less than 20 Erythrityl Tetranitrate Tablets, and carefully reduce them to a powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 250 mg. of erythrityl tetranitrate, transfer it to a small, lipped, glass mortar, and add enough ether to make the total liquid measure about 20 cc. Cautiously triturate with the ether for 5 minutes, then allow the undissolved portion to subside, and carefully decant the ether through a small filter paper, wetted with ether, into a tared beaker. Repeat this extraction with ether several times, each time with about 10 cc. of ether, until 0.5 cc. of the last filtrate, evaporated to dryness at room temperature, leaves no weighable residue. Wash the filter paper and the stem of the funnel with 5 cc. of ether, evaporate the combined ether extracts and washings to dryness at a temperature not exceeding 35°, dry over sulfuric acid in a vacuum desiccator for 18 hours, and weigh the erythrityl tetranitrate thus obtained.

Packaging and storage—Preserve Erythrityl Tetranitrate Tablets in well-closed containers.

Sizes—Erythrityl Tetranitrate Tablets usually available contain the following amounts of erythrityl tetranitrate: 15 and 30 mg. (¼ and ½ grain).

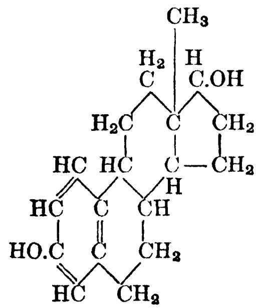
AVERAGE DOSE OF ERYTHRITYL TETRANITRATE—**30 mg.** (approximately ½ grain).

Estradiol

ESTRADIOL

Estradiol

Dihydrotheelin, Œstradiol



$C_{18}H_{24}O_2$ Mol. wt. 272.37

Alpha-estradiol.

Description—Estradiol occurs as white or slightly yellow, small crystals or as a crystalline powder. It is odorless and is stable in air.

Solubility—Estradiol is almost insoluble in water; it is soluble in alcohol, in acetone, in dioxane, and in solutions of fixed alkali hydroxides; it is sparingly soluble in vegetable oils.

Melting range—Estradiol melts between 173° and 179°, page 667.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Estradiol, determined in a solution in dioxane containing 100 mg. of Estradiol, previously dried over sulfuric acid for 4 hours, in each 10 cc. and using a 100-mm. tube, is not less than +76° and not more than +83°, page 675.

Identification—

A: Dissolve about 2 mg. of Estradiol in 2 cc. of sulfuric acid: the solution is greenish yellow and exhibits a green fluorescence. When the solution is diluted with 2 cc. of water, the color changes to pale orange. If 1 drop of ferric ammonium sulfate T.S. is added to the sulfuric acid solution before dilution with the water, the green color is strongly intensified, and after dilution with the water, the color is red.

B: Mix 50 mg. of sulfanilic acid with 2 cc. of diluted hydrochloric acid, warm the mixture, then cool it in ice water, and slowly add, with agitation, 0.3 cc. of a solution of sodium nitrite (1 in 10). Dissolve 5 mg. of Estradiol in 5 cc. of a solution of potassium hydroxide (1 in 10), and add this solution to the diazotized sulfanilic acid: a deep red color is produced.

C: Dissolve 50 mg. of Estradiol in 8 cc. of potassium hydroxide T.S., warming, if necessary, to facilitate solution. Cool the solution to 5°, then add slowly, while shaking, 0.7 cc. of a mixture of equal volumes of benzoyl chloride and of ether, and shake until the odor of benzoyl chloride disappears. Filter the precipitate of estradiol benzoate so formed and wash it with water until the last washing is neutral, then recrystallize it twice from 2.5- to 3-cc. portions of hot alcohol. The estradiol benzoate so obtained, after drying at 100° for 1 hour, melts between 191° and 196°, page 667.

Residue on ignition—The residue on ignition from 100 mg. of Estradiol is negligible, page 685.

Packaging and storage—Preserve Estradiol in well-closed, light-resistant containers.

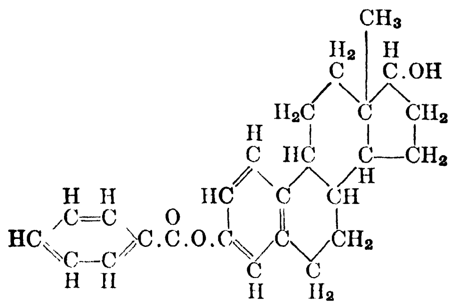
AVERAGE DOSE—**0.2 mg.** (approximately 1/300 grain).

Estradiol Benzoate

ESTRADIOL BENZOATE

Estradiolis Benzoas

Estradiol. Benz.—Œstradiol Monobenzoate



$C_{18}H_{23}O.C_7H_5O_2$ **Mol. wt. 376.47**

The benzoate of alpha-estradiol.

Description—Estradiol Benzoate occurs as a white or slightly yellow to brownish, crystalline powder. It is odorless, and is stable in air.

Solubility—Estradiol Benzoate is almost insoluble in water; it is soluble in alcohol, in acetone, and in dioxane. It is slightly soluble in ether, and sparingly soluble in vegetable oils.

Melting range—Estradiol Benzoate melts between 191° and 196°, page 667.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Estradiol Benzoate determined in a solution in dioxane, containing 200 mg. of Estradiol Benzoate, previously dried for 4 hours over sulfuric acid, in each 10 cc. and using a 100-mm. tube, is not less than +58° and not more than +63°, page 675.

Identification—

A: Dissolve 2 mg. of Estradiol Benzoate in 2 cc. of sulfuric acid: the solution is greenish yellow and exhibits a blue fluorescence. When this solution is diluted with 2 cc. of water, the color changes to pale orange.

B: Dissolve 100 mg. of Estradiol Benzoate in 10 cc. of methanol, add 100 mg. of potassium carbonate dissolved in 0.5 cc. of water, and reflux the mixture on a steam bath for 2 hours. Add 30 cc. of water, and heat gently until the alcohol is evaporated. Then add 15 cc. of water, and keep the solution at a temperature between 5° and 10° for 1 hour. Filter the precipitate, wash it with cold water until the washings are neutral to litmus paper, then dry it at about 80°. The estradiol so obtained melts between 173° and 179°, page 667.

C: Mix 50 mg. of sulfanilic acid with 2 cc. of diluted hydrochloric acid, warm the mixture, then cool it in ice water, and slowly add, with agitation, 0.3 cc. of a solution of sodium nitrite (1 in 10). Dissolve 5 mg. of the estradiol obtained in *Identification test B* in 5 cc. of a solution of potassium hydroxide (1 in 10), and add this solution to the diazotized sulfanilic acid: a deep red color is produced.

D: Evaporate the filtrate from *Identification test B* to about 5 cc., cool, filter if necessary, and add to the filtrate 2 cc. of diluted hydrochloric acid: a white precipitate is formed. Extract the precipitate with 5 cc. of ether, evaporate the ether, and dry the residue at about 70°. The melting point of the benzoic acid so obtained is between 120° and 122°.

Residue on ignition—The residue on ignition from 100 mg. of Estradiol Benzoate is negligible, page 685.

Completeness and reaction of solution—Dissolve 100 mg. of Estradiol Benzoate in 5 cc. of warm alcohol: no insoluble residue remains, and the solution after cooling is only slightly acid to litmus paper.

Packaging and storage—Preserve Estradiol Benzoate in well-closed, light-resistant containers.

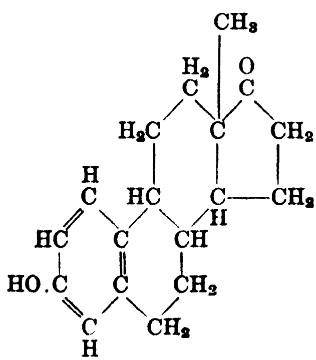
AVERAGE DOSE—Intramuscular, 1 **mg.** (approximately 1/60 grain).

Estrone

ESTRONE

Estronum

Estron.—Theelin, Œstrone



$C_{18}H_{22}O_2$ **Mol. wt. 270.36**

Description—Estrone occurs as small, white crystals, or as a white, crystalline powder. It is odorless and is stable in air.

Solubility—Estrone is slightly soluble in water but is soluble in alcohol, in acetone, in dioxane, and in solutions of fixed alkali hydroxides.
Melting range—Estrone melts between 258° and 262°, page 667.
Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Estrone, determined in a dioxane solution containing 100 mg. of Estrone in each 10 cc. of solution and using a 100-mm. tube, is not less than +158° and not more than +168°, page 675.
Identification—
A: Dissolve 50 mg. of Estrone in 6 cc. of pyridine and 2 cc. of acetic anhydride, and heat at 95° for 24 hours. Add 10 cc. of dilute alcohol and evaporate in a vacuum to a thick oil. Add about 1 cc. of dilute alcohol and set aside to crystallize. Filter out the crystals and recrystallize twice from hot alcohol: the estrone acetate so obtained melts between 125° and 127°.
B: Dissolve 50 mg. of Estrone and 50 mg. of hydroxylamine hydrochloride in 10 cc. of alcohol, add 1 cc. of glacial acetic acid, and boil under a reflux condenser for 5 hours. Add 10 cc. of water and recrystallize the precipitate twice from hot alcohol: the estrone oxime so obtained melts between 229° and 231°.
Residue on ignition—The residue on ignition from 100 mg. of Estrone is negligible, page 685.
Packaging and storage—Preserve Estrone in tight, light-resistant containers.

AVERAGE DOSE—Intramuscular, **1 mg.** (approximately 1/60 grain).

Ether

ETHER

Æther

Ethyl Ether, Diethyl Ether

$C_4H_{10}O$ $C_2H_5.O.C_2H_5$ Mol. wt. 74.12

Ether contains from 96 per cent to 98 per cent of $C_4H_{10}O$, the remainder consisting of alcohol and water.

Caution—Ether to be used for anesthesia must be preserved in tight containers of not more than 3 Kg. capacity and is not to be used for anesthesia if it has been removed from the original container longer than 24 hours. Ether to be used for anesthesia may, however, be shipped in larger containers for repackaging in containers as directed above, provided the ether at the time of repackaging meets the requirements of the tests of this Pharmacopœia.

Description—Ether is a transparent, colorless, mobile liquid, having a characteristic odor, and a burning, sweetish taste. It is slowly oxidized by the action of air, moisture, and light, with the formation of peroxides. Ether boils at about 35°; *it is highly volatile and inflammable. Its vapor, when mixed with air and ignited, may explode violently.*
Solubility—Ether dissolves in about 12 times its volume of water with slight contraction of volume. It is miscible with alcohol, benzene, chloroform, petroleum benzin, and with fixed and volatile oils.
Specific gravity—The specific gravity of Ether is not less than 0.713 and not more than 0.716.

Acid—Place 10 cc. of 80 per cent alcohol in a 50-cc. glass-stoppered flask, add 0.5 cc. of phenolphthalein T.S., and just sufficient fiftieth-normal sodium hydroxide to produce a pink color which persists after shaking the mixture for 30 seconds. Then add 25 cc. of Ether, stopper the flask, mix gently, and again add fiftieth-normal sodium hydroxide until the pink color persists after shaking the mixture for 30 seconds: not more than 0.4 cc. additional fiftieth-normal sodium hydroxide is required to neutralize the Ether.

Residue on evaporation—Allow 50 cc. of Ether to evaporate spontaneously from a tared shallow dish, and dry at 100° for 1 hour: the weight of the residue does not exceed 1 mg.

Foreign odor—Place 10 cc. of Ether in a clean, dry, evaporating dish, and allow it to evaporate spontaneously to a volume of about 1 cc.: no foreign odor is perceptible. Transfer this residue to a piece of clean, odorless, absorbent paper: no foreign odor is perceptible when the last traces of Ether evaporate from the paper.

Aldehyde—Place 20 cc. of Ether in a colorless, glass-stoppered cylinder, and add 7 cc. of a mixture of 1 cc. of alkaline mercuric potassium iodide T.S. and 17 cc. of a saturated solution of reagent sodium chloride. Stopper the cylinder, and shake it vigorously for 10 seconds, then set it aside for 1 minute: the water layer shows no turbidity.

Peroxide—Shake 10 cc. of Ether occasionally during 1 hour with 1 cc. of a freshly prepared solution of potassium iodide (1 in 10), in a 25-cc. glass-stoppered cylinder of colorless glass, protected from light: when viewed transversely against a white background, no color is seen in either liquid.

Packaging and storage—Preserve Ether in partly filled, tight, light-resistant containers, remote from fire. It is recommended that Ether be kept at a temperature which does not exceed 25°.

PAGE
Ether, Vinyl.. 598

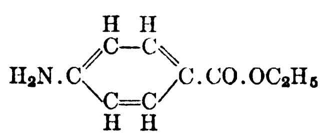
Ethyl Aminobenzoate

ETHYL AMINOBENZOATE

Æthylis Aminobenzoas

Æthyl. Aminobenz. -Benzocaine

$C_9H_{11}O_2N$



Mol. wt. 165.19

Description—Ethyl Aminobenzoate occurs as small, white crystals, or as a white, crystalline powder. It is odorless, and is stable in air.

Solubility—One Gm. of Ethyl Aminobenzoate dissolves in about 2500 cc. of water, in 5 cc. of alcohol, in 2 cc. of chloroform, in about 4 cc. of ether, and in 30 to 50 cc. of expressed almond oil or olive oil. It dissolves in dilute acids.

Melting range—Ethyl Aminobenzoate melts between 88° and 90°, page 667.

Identification—

A: When Ethyl Aminobenzoate is boiled with a solution of an alkali hydroxide, alcohol is produced.

B: Dissolve about 20 mg. of Ethyl Aminobenzoate in 10 cc. of water with the aid of a few drops of diluted hydrochloric acid, and add to the solution 5 drops of a solution of sodium nitrite (1 in 10), followed by 2 cc. of a solution of 100 mg. of betanaphthol in 5 cc. of sodium hydroxide T.S.: an orange-red precipitate is formed in the mixture.

C: A solution of Ethyl Aminobenzoate (1 in 50), prepared with the aid of a slight excess of diluted hydrochloric acid, yields a precipitate with iodine T.S.

Free acid—Dissolve 1 Gm. of Ethyl Aminobenzoate in 10 cc. of neutralized alcohol: a clear solution results. Dilute this solution with 10 cc. of water, and add 2 drops of phenolphthalein T.S. and 1 drop of tenth-normal sodium hydroxide: a red color is produced in the mixture.

Loss on drying—When dried over sulfuric acid for 3 hours, Ethyl Aminobenzoate loses not more than 1 per cent of its weight.

Residue on ignition—Ethyl Aminobenzoate yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—Add a few drops of silver nitrate T.S. to a solution of 200 mg. of Ethyl Aminobenzoate in 5 cc. of alcohol, previously acidified with a few drops of diluted nitric acid: no immediate turbidity is produced.

Readily carbonizable substances—Dissolve 500 mg. of Ethyl Aminobenzoate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Heavy metals—Dissolve 1 Gm. of Ethyl Aminobenzoate in 20 cc. of alcohol, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with alcohol. The heavy metals limit, page 657, for Ethyl Aminobenzoate is 10 parts per million.

Packaging and storage—Preserve Ethyl Aminobenzoate in well-closed containers.

Ethyl Aminobenzoate Ointment

ETHYL AMINOBENZOATE OINTMENT

Unguentum Æthylis Aminobenzoatis

Ung. Æthyl. Aminobenz.

ETHYL AMINOBENZOATE, in very fine powder..........	50 Gm.
WHITE OINTMENT..................................	950 Gm.
To make..........................	1000 Gm.

Levigate the ethyl aminobenzoate with a portion of the white ointment until a smooth mixture results, and then incorporate the remainder of the base (see page 2).

Ethyl Chloride

ETHYL CHLORIDE

Æthylis Chloridum

Æthyl. Chlor.

C_2H_5Cl $CH_3.CH_2Cl$ Mol. wt. 64.52

Caution—Ethyl Chloride is very inflammable and must not be used near a flame.

Description—At low temperatures or under increased pressure, Ethyl Chloride is a colorless, mobile, very volatile liquid, boiling between 12° and 13°. Its specific gravity is about 0.921 at 0°. It has a characteristic, ethereal odor, and a burning taste. When Ethyl Chloride is liberated at ordinary room temperature from its sealed container, it vaporizes at once. It burns with a smoky, greenish flame, producing hydrogen chloride.

Solubility—Ethyl Chloride is slightly soluble in water, and dissolves freely in alcohol and in ether.

Free acid—Shake 10 cc. of Ethyl Chloride with 10 cc. of water, both previously cooled to 0°, and allow the supernatant layer of Ethyl Chloride to volatilize spontaneously: the resultant remaining liquid is neutral to litmus paper.

Non-volatile residue—Allow 5 cc. of Ethyl Chloride to evaporate spontaneously from a shallow dish: no foreign odor is noticeable while the last portions evaporate, and the weight of the residue is negligible.

Chloride ion—Add a few drops of silver nitrate T.S. to 10 cc. of alcohol, cool to 0°, and add to the clear liquid about 0.5 cc. of Ethyl Chloride cooled to the same temperature: no turbidity is produced at once.

Alcohol—To the liquid obtained in the test for *Free acid*, add a few drops of potassium dichromate T.S. and 2 cc. of diluted sulfuric acid, and boil the mixture: no odor of acetaldehyde is developed, and no greenish or purplish color is produced.

Packaging and storage—Preserve Ethyl Chloride in tight containers, preferably hermetically sealed, and remote from fire.

Ethyl Oxide

ETHYL OXIDE

Æthylis Oxidum

Æthyl. Oxid.—Solvent Ether

$C_4H_{10}O$ $C_2H_5.O.C_2H_5$ Mol. wt. 74.12

Ethyl Oxide contains from 96 per cent to 98 per cent of $C_4H_{10}O$, the remainder consisting of alcohol and water.

Caution—Ethyl Oxide must not be used for anesthesia.

Description—Ethyl Oxide agrees in description and physical properties with *Ether*, page 209.

Aldehyde—Shake 10 cc. of Ethyl Oxide occasionally during 2 hours with 1 cc. of potassium hydroxide T.S. in a glass-stoppered cylinder of colorless glass protected from light: no color develops in either liquid.

Peroxide—Shake 10 cc. of Ethyl Oxide for 1 minute with 1 cc. of a freshly prepared solution of potassium iodide (1 in 10) in a glass-stoppered cylinder of colorless glass: when viewed transversely against a white background, no color is seen in either liquid.

Other requirements—In all other respects Ethyl Oxide has the properties of, and conforms to the tests under *Ether*, page 209.

Packaging and storage—Preserve Ethyl Oxide in partly filled, tight, light-resistant containers, remote from fire. It is recommended that Ethyl Oxide be kept at a temperature which does not exceed 25°.

ETHYLENE

Æthylenum

Æthylen.

C_2H_4 $CH_2{=}CH_2$ Mol. wt. 28.05

Ethylene contains not less than 99 per cent by volume of C_2H_4.

Description—Ethylene is a colorless gas, somewhat lighter than air, and has a slightly sweet odor and taste. A liter of Ethylene at a pressure of 760 mm. and at 0° weighs 1.260 Gm.

Solubility—One volume of Ethylene dissolves in about 4 volumes of water at 0° and in about 9 volumes of water at 25°. One volume of it dissolves in about 0.5 volume of alcohol at 25° and in about 0.05 volume of ether at 15.5°.

Identification—

A: Ethylene is slowly soluble in sulfuric acid but is rapidly absorbed by fuming sulfuric acid and concentrated solutions of potassium permanganate

B: Bubble Ethylene through bromine T.S.: the reagent is decolorized.

Note—Cylinders containing Ethylene must be kept at a temperature of 25° ± 2° for at least 6 hours before the Ethylene is withdrawn for the following determinations. Samples for the following tests and assay are to be corrected to a pressure of 760 mm. and a temperature of 25°.

Acid or alkali—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of three color-comparator tubes of clear glass, of approximately the same size and marked "A," "B," "C," respectively. Add 0.2 cc. of hundredth-normal hydrochloric acid to tube "B," and 0.4 cc. of hundredth-normal hydrochloric acid to tube "C." Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Ethylene through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that of the solution in tube "C" and no deeper yellow than that of the solution in tube "A."

Carbon dioxide—Pass 1000 cc. of Ethylene through 50 cc. of clear barium hydroxide T.S., contained in a vessel of such size and shape that the depth of the solution is from 12 to 14 cm., employing a delivery tube with an orifice approximately 1 mm. in diameter and extending to within 2 mm. of the bottom of the vessel, and regulating the flow of the Ethylene so as to require approximately 15 minutes for the delivery of 1000 cc. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution of 100 mg. of sodium bicarbonate in 100 cc. of freshly boiled and cooled water is added to 50 cc. of clear barium hydroxide T.S.

Acetylene, aldehyde, hydrogen sulfide, phosphine—Under the conditions prescribed in the test for *Carbon dioxide*, pass 1000 cc. of Ethylene through 25 cc. of silver ammonium nitrate T.S.: no turbidity or darkening is produced.

Carbon monoxide—Collect, separately, in suitable flasks, 1000-cc. portions of Ethylene and of air obtained at a place removed from sources of carbon monoxide. Add 10 cc. of water to 0.5 cc. of blood, page 748, and mix thoroughly. Immediately add 2.5 cc. of the blood dilution to each flask, stopper, and shake the flasks frequently during 15 minutes. To each flask add 40 mg. of a mixture of equal parts by weight of pyrogallol and tannic acid. Shake thoroughly, and allow the flasks to stand in the dark for 15 minutes. Pour the contents of each flask into a test tube for observation. The solution from the Ethylene being tested shows no pink coloration and matches the gray color produced in the solution from the air.

Assay—Place a sufficient quantity of clean mercury in a 100-cc. gas burette or nitrometer provided with a two-way stopcock and a two-way outlet and properly connected with a balancing tube. Connect one of the outlet tubes with a gas pipette

of suitable capacity, containing 125 cc. of bromine T.S. By proper manipulation of the balancing tube, draw the bromine T.S. (excluding bubbles of air) through the capillary of the pipette, the outlet tube, and the bore of the stopcock of the burette, and at once close the stopcock. Now by reversing the movement of the balancing tube, completely fill the burette, the other bore of the stopcock, and the other outlet tube with mercury. Draw into the burette about 105 cc. of Ethylene by again lowering the balancing tube. Disconnect the container of gas, and, with the stopcock open, adjust the volume of Ethylene to exactly 100 cc., having the level of the mercury exactly the same in the burette and balancing tube, and close the stopcock. Raise the balancing tube to increase the pressure in the burette, and open the other bore of the stopcock, forcing all of the Ethylene into the gas pipette. Close the stopcock, and rock the gas pipette gently for 5 minutes. Open the stopcock, and lower the balancing bulb to draw the gas completely back to the burette, then raise the balancing tube, and force the gas once more into the pipette. Gently rock the pipette until there is no further apparent diminution of the volume of the gas. Draw the residual gas completely into the burette, close the stopcock, remove the bromine pipette, and replace it with one containing potassium hydroxide solution (1 to 1). Force the residual gas into the pipette, rock it gently for 5 minutes, return the gas to the burette, close the bore of the stopcock, and equalize the height of mercury in the two tubes of the burette. Not more than 1 cc. of gas remains.

Packaging and storage—Preserve Ethylene in cylinders, remote from fire.

Labeling—Label Ethylene with the statement "*Caution—Ethylene is inflammable, and a mixture of it with oxygen or air will explode when brought in contact with a flame or other causes of ignition.*"

Ethylenediamine Solution

ETHYLENEDIAMINE SOLUTION

Liquor Æthylenediaminæ

Liq. Æthylenediam.

Ethylenediamine Solution contains not less than 67 per cent and not more than 71 per cent of ethylenediamine ($H_2N.CH_2.CH_2.NH_2$).

Description—Ethylenediamine Solution is a clear, colorless, or only slightly yellow liquid, having an ammonia-like odor and a strong alkaline reaction. It is miscible with water and with alcohol.

Identification—To 2 cc. of cupric sulfate solution (1 in 100) add 3 drops of a solution of Ethylenediamine Solution (1 in 6) and shake: a purplish blue color is produced.

Non-volatile matter—Evaporate 5 cc. of Ethylenediamine Solution to dryness on a steam bath, and dry the residue at 100° for 1 hour: the weight of the residue does not exceed 1.0 mg.

Heavy metals—To the residue obtained in the test for *Non-volatile matter* add 1 cc. of hydrochloric acid and 0.5 cc. of nitric acid, and evaporate to dryness on a steam bath. Dissolve the residue in 20 cc. of warm water, cool, add sufficient water to make 100 cc., mix well, and use 20 cc. of this solution for the test for heavy metals. The heavy metals limit, page 657, for Ethylenediamine Solution is 20 parts per million.

Ammonia and other bases—Weigh accurately about 1.5 cc. of Ethylenediamine Solution, and transfer it, with the aid of alcohol, to a small dish or beaker. Add, with stirring, 20 cc. of diluted hydrochloric acid, rinse the rod with 50 cc. of alcohol and evaporate the solution to dryness on a steam bath; then dry at 110° to constant weight. The weight of the ethylenediamine dihydrochloride so obtained,

multiplied by 0.4517, represents the weight of ethylenediamine, and corresponds to within 0.5 per cent above or below the percentage of ethylenediamine found by the assay.

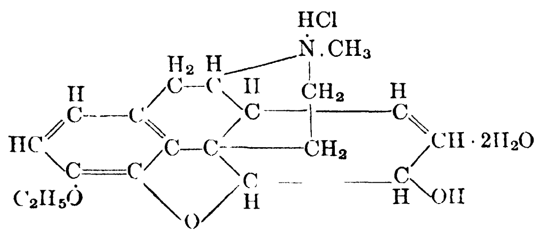
Assay—Weigh accurately about 1.5 cc. of Ethylenediamine Solution in a glass-stoppered flask tared with about 25 cc. of water. Dilute with water to about 75 cc., add 3 drops of bromophenol blue T.S., and titrate with normal hydrochloric acid to the production of a yellow color. Each cc. of normal hydrochloric acid is equivalent to 30.05 mg. of $H_2N.CH_2.CH_2.NH_2$.

Packaging and storage—Preserve Ethylenediamine Solution in tight containers.

ETHYLMORPHINE HYDROCHLORIDE

Æthylmorphinæ Hydrochloridum

Æthylmorph. Hydrochlor.



$C_{19}H_{23}O_3N.HCl.2H_2O$ Mol. wt. 385.88

Description—Ethylmorphine Hydrochloride occurs as a white, or faintly yellow, odorless, microcrystalline powder. It melts with decomposition at about 123°.

Solubility—One Gm. of Ethylmorphine Hydrochloride dissolves in 10 cc. of water and in 25 cc. of alcohol. It is slightly soluble in ether and in chloroform.

Identification—

A: Add a drop of ferric chloride T.S. to a solution of about 10 mg. of Ethylmorphine Hydrochloride in 10 cc. of sulfuric acid, and warm it on a water bath: the mixture at first becomes green, then deep violet-blue, and after the addition of a drop of nitric acid, deep red.

B: Silver nitrate T.S. produces in a solution of Ethylmorphine Hydrochloride (1 in 20) a white precipitate which is insoluble in nitric acid.

Distinction from codeine hydrochloride—Add 1 cc. of ammonia T.S. to 5 cc. of a solution of Ethylmorphine Hydrochloride (1 in 25): a white turbidity is immediately produced.

Free acid—A solution of 500 mg. of Ethylmorphine Hydrochloride in 15 cc. of water requires not more than 0.3 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried for 4 hours at 100°, Ethylmorphine Hydrochloride loses not more than 10 per cent of its weight.

Residue on ignition—The residue on ignition from 200 mg. of Ethylmorphine Hydrochloride is negligible, page 685.

Ammonium compounds—Heat 5 cc. of a solution of Ethylmorphine Hydrochloride (1 in 20) with 5 cc. of sodium hydroxide T.S. in a test tube in a water bath: moistened red litmus paper held in the escaping vapors does not at once turn blue.

Morphine—Dissolve about 50 mg. of potassium ferricyanide in 10 cc. of water, and add 1 cc. of diluted ferric chloride solution (1 volume of ferric chloride T.S. to 9

volumes of water) and 1 cc. of a solution of Ethylmorphine Hydrochloride (1 in 100): the mixture does not at once become green or blue.

Packaging and storage—Preserve Ethylmorphine Hydrochloride in well-closed containers.

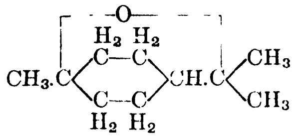
AVERAGE DOSE—**15 mg.** (approximately ¼ grain).

Eucalyptol

EUCALYPTOL

Eucalyptol

Cineol



$C_{10}H_{18}O$ Mol. wt. 154.24

Eucalyptol is obtained from eucalyptus oil and from other sources.

Description—Eucalyptol is a colorless liquid, having a characteristic, aromatic, distinctly camphoraceous odor, and a pungent, cooling, spicy taste.

Solubility—Eucalyptol is insoluble in water, but is soluble in 5 volumes of 60 per cent alcohol. It is miscible with alcohol, chloroform, ether, glacial acetic acid, and with fixed and volatile oils.

Specific gravity—The specific gravity of Eucalyptol is not less than 0.921 and not more than 0.924.

Congealing temperature—Eucalyptol congeals at a temperature not lower than 0°, page 629.

Boiling range—Eucalyptol distils between 174° and 177°, page 624.

Optical rotation—The optical rotation of Eucalyptol is not more than ±0.3° in a 100 mm. tube at 25°, page 675.

Refractive index—The refractive index of Eucalyptol is not less than 1.4550 and not more than 1.4600 at 20°, page 682.

Identification—Place 1 cc. of Eucalyptol in a test tube, in a freezing mixture, and gradually add an equal volume of phosphoric acid: a solid, white, crystalline mass of eucalyptol-phosphoric acid forms, from which Eucalyptol separates upon the addition of warm water.

Reaction—An alcohol solution of Eucalyptol (1 in 10) is neutral to moistened litmus paper.

Phenols—

A: Shake 5 cc. of Eucalyptol with 5 cc. of sodium hydroxide T.S.: the volume of the Eucalyptol is not diminished.

B: Shake 1 cc. of Eucalyptol with 20 cc. of water, and allow the liquids to separate. To 10 cc. of the water layer, separated from the Eucalyptol, add 1 drop of ferric chloride T.S.: the mixture develops no violet color.

Packaging and storage—Preserve Eucalyptol in tight containers.

EUCALYPTUS OIL

Oleum Eucalypti

Ol. Eucalypt.

Eucalyptus Oil is the volatile oil distilled with steam from the fresh leaves of *Eucalyptus Globulus* Labillardière, or from other species of Eucalyptus (Fam. *Myrtaceæ*). It contains not less than 70 per cent of eucalyptol ($C_{10}H_{18}O$).

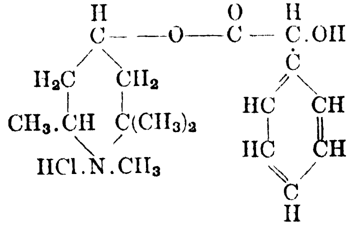
Description—Eucalyptus Oil is a colorless or pale yellow liquid, having a characteristic, aromatic, somewhat camphoraceous odor, and a pungent, spicy, cooling taste.
Solubility—Eucalyptus Oil is soluble in 5 volumes of 70 per cent alcohol.
Specific gravity—The specific gravity of Eucalyptus Oil is not less than 0.905 and not more than 0.925.
Congealing temperature—Eucalyptus Oil congeals at a temperature not lower than −15.4°, indicating not less than 70 per cent of eucalyptol ($C_{10}H_{18}O$), page 629.
Refractive index—The refractive index of Eucalyptus Oil is not less than 1.4580 and not more than 1.4700 at 20°, page 682.
Reaction—A solution of recently distilled Eucalyptus Oil in 70 per cent alcohol (1 in 5) is neutral to moistened litmus paper.
Heavy metals—Eucalyptus Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 658.
Phellandrene—Mix 2.5 cc. of Eucalyptus Oil with 5 cc. of petroleum benzin, add 5 cc. of a solution of sodium nitrite made by dissolving 5 Gm. of sodium nitrite in 8 cc. of water, then gradually add 5 cc. of glacial acetic acid: no crystals form in the mixture within 10 minutes.
Packaging and storage—Preserve Eucalyptus Oil in tight containers.

AVERAGE DOSE—**0.5 cc.** (approximately 8 minims).

EUCATROPINE HYDROCHLORIDE

Eucatropinæ Hydrochloridum

Eucatrop. Hydrochlor.



$C_{17}H_{25}O_3N.HCl$ Mol. wt. 327.84

Eucatropine Hydrochloride, when dried over sulfuric acid for 4 hours, contains not less than 86.5 per cent and not more than 89 per cent of

eucatropine ($C_{17}H_{25}O_3N$) corresponding to not less than 97 per cent of $C_{17}H_{25}O_3N.HCl$.

Description—Eucatropine Hydrochloride occurs as a white, granular, odorless powder. Its solutions are neutral to litmus paper.

Solubility—Eucatropine Hydrochloride is very soluble in water, freely soluble in alcohol and in chloroform; it is insoluble in ether.

Melting temperature—Eucatropine Hydrochloride melts at a temperature not lower than 183°, page 667.

Identification—

A: Solutions of Eucatropine Hydrochloride (1 in 50) are precipitated by sodium carbonate T.S., mercuric-potassium iodide T.S., iodine T.S., trinitrophenol T.S., and many other reagents for alkaloids.

B: Recrystallize the free base, obtained in the *Assay*, from petroleum benzin: it melts not below 111°, page 667.

C: A solution of Eucatropine Hydrochloride responds to the test for *Chloride*, page 659.

Residue on ignition—Eucatropine Hydrochloride yields not more than 0.1 per cent of residue on ignition, page 685.

Atropine, scopolamine or hyoscyamine—Add 5 drops of nitric acid to about 50 mg. of Eucatropine Hydrochloride, evaporate to dryness on a water bath, cool the residue, and add 5 drops of half-normal alcoholic potassium hydroxide together with a fragment of potassium hydroxide: no violet color results.

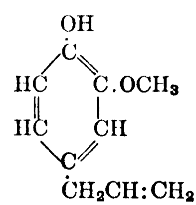
Assay—Dissolve about 1 Gm. of Eucatropine Hydrochloride, previously dried for 4 hours over sulfuric acid and accurately weighed, in 10 cc. of water. Make alkaline with ammonia T.S., and extract with successive portions of ether until the alkaloid is completely extracted. Wash the combined ether extracts with 10 cc. of water, and extract the water washing with 10 cc. of ether. Allow the combined ether solutions to evaporate spontaneously, and dry the residue of eucatropine to constant weight at 80°.

Packaging and storage—Preserve Eucatropine Hydrochloride in tight, light-resistant containers.

Eugenol

EUGENOL

Eugenol



$C_{10}H_{12}O_2$ Mol. wt. 164.[illegible]0

Eugenol is a phenol obtained from clove oil and from other sources.

Description—Eugenol is a colorless, or pale yellow liquid, having a strongly aromatic odor of clove and a pungent, spicy taste. Exposure to air causes it to become darker and thicker. Eugenol is optically inactive.

Solubility—Eugenol is slightly soluble in water, but is miscible with alcohol, with chloroform, with ether, and with fixed oils. It is soluble in twice its volume of 70 per cent alcohol.

Specific gravity—The specific gravity of Eugenol is not less than 1.064 and not more than 1.070.

Boiling range—Eugenol distils between 250° and 255°, page 667.

Refractive index—The refractive index of Eugenol is not less than 1.5400 and not more than 1.5420 at 20°, page 682.

Hydrocarbons—Dissolve 1 cc. of Eugenol in 20 cc. of half-normal sodium hydroxide in a 50-cc. stoppered tube, add 18 cc. of water, and mix: a clear mixture results immediately, but it may become turbid when exposed to air.

Phenol—Shake 1 cc. of Eugenol with 20 cc. of water, filter, and add 1 drop of ferric chloride T.S. to 5 cc. of the clear filtrate: the mixture exhibits a transient grayish green color but not a blue or violet color.

Packaging and storage—Preserve Eugenol in tight, light-resistant containers.

Fennel Oil

FENNEL OIL

Oleum Fœniculi

Ol. Fœnic.

Fennel Oil is the volatile oil distilled with steam from the dried ripe fruit of *Fœniculum vulgare* Miller (Fam. *Umbelliferæ*).

Note—If solid material has separated, carefully warm the Oil at a low temperature until it is completely liquefied and thoroughly mix it before using.

Description—Fennel Oil is a colorless or pale yellow liquid, having the characteristic odor and taste of fennel.

Solubility—Fennel Oil is soluble in 8 volumes of 80 per cent alcohol and in 1 volume of 90 per cent alcohol.

Specific gravity—The specific gravity of Fennel Oil is not less than 0.953 and not more than 0.973.
Congealing temperature—Fennel Oil congeals at a temperature not lower than 3°, page 629.
Optical rotation—The optical rotation of Fennel Oil is not less than +12° and not more than +24° in a 100-mm. tube at 25°, page 675.
Refractive index—The refractive index of Fennel Oil is not less than 1.5280 and not more than 1.5380 at 20°, page 682.
Heavy metals—Fennel Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 657.
Reaction—A solution of recently distilled Fennel Oil in 80 per cent alcohol (1 in 8) is neutral to moistened litmus paper.
Packaging and storage—Preserve Fennel Oil in tight containers.

Fennel Water

FENNEL WATER

Aqua Fœniculi

Aq. Fœnic.

Fennel Water is a clear, saturated solution of fennel oil in distilled water, prepared by one of the processes described under *Waters*, page 726.

Ferric Ammonium Citrate

FERRIC AMMONIUM CITRATE

Ferri Ammonii Citras

Ferr. Ammon. Cit.—Iron and Ammonium Citrates U. S. P. XII

Ferric Ammonium Citrate contains not less than 16.5 per cent and not more than 18.5 per cent of Fe.

Description—Ferric Ammonium Citrate occurs as thin, transparent, garnet red scales or granules, or as a brownish yellow powder. It is odorless, and has a saline, mildly ferruginous taste. It is deliquescent in air and is affected by light. Its solutions are neutral or only slightly acid or slightly alkaline to litmus paper.
Solubility—Ferric Ammonium Citrate is very soluble in water. It is insoluble in alcohol.
Identification—
A: When strongly heated, Ferric Ammonium Citrate chars, and finally leaves a residue of ferric oxide.
B: Ammonia T.S. added to a solution of Ferric Ammonium Citrate (1 in 100) produces no precipitate, but darkens the solution.
C: To 5 cc. of a solution of Ferric Ammonium Citrate (1 in 100) add 0.3 cc. of potassium permanganate T.S. and 4 cc. of mercuric sulfate T.S. and heat the mixture to boiling: a white precipitate is produced.

D: Remove the iron from 10 cc. of a solution of Ferric Ammonium Citrate (1 in 10) by boiling it with an excess of potassium hydroxide T.S., filter, and then slightly acidify 4 cc. of the filtrate with acetic acid: a portion of the cooled filtrate, when mixed with 2 cc. of calcium chloride T.S., and again heated to boiling, gradually deposits a white, crystalline precipitate.

Ferric citrate—A solution of Ferric Ammonium Citrate (1 in 100) does not yield a blue precipitate with potassium ferrocyanide T.S. unless it has been previously acidified with hydrochloric acid.

Tartrate—The remainder of the filtrate obtained in *Identification test D*, when acidified more strongly with acetic acid and allowed to stand for 24 hours, does not yield a white, crystalline precipitate.

Lead—Dissolve 1 Gm. of Ferric Ammonium Citrate in about 30 cc. of water, add 5 cc. of a mixture of equal volumes of nitric acid and water, and boil gently for 5 minutes. Cool, dilute with water to 50 cc., and mix well. Determine the lead in exactly 20 cc. of the solution by the *Dithizone method*, page 641, beginning with "Add 6 cc. of ammonium citrate solution." Correct for a blank. Not more than 20 parts per million of lead is found.

Assay—Weigh accurately about 1 Gm. of Ferric Ammonium Citrate, dissolve it in 25 cc. of water in a glass-stoppered flask, add 5 cc. of hydrochloric acid and 4 Gm. of potassium iodide, stopper the flask, and allow it to stand for 15 minutes in the dark. Dilute with 100 cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 5.585 mg. of Fe.

Packaging and storage—Preserve Ferric Ammonium Citrate in tight, light-resistant containers.

AVERAGE DOSE—1 Gm. (approximately 15 grains).

FERRIC AMMONIUM CITRATE CAPSULES

Capsulæ Ferri Ammonii Citratis

Cap. Ferr. Ammon. Cit.—Iron and Ammonium Citrates Capsules U. S. P. XII

Ferric Ammonium Citrate Capsules contain an amount of iron (Fe) corresponding to not less than 15.5 per cent and not more than 19.5 per cent of the labeled amount of ferric ammonium citrate.

Identification—The contents of Ferric Ammonium Citrate Capsules respond to *Identification tests B, C*, and *D* under Ferric Ammonium Citrate, page 220.

Assay—Transfer as completely as possible the contents of a counted number of not less than 20 Ferric Ammonium Citrate Capsules to a 250-cc. volumetric flask. Place the emptied capsules in a beaker, and add sufficient cold water to cover them. Allow to stand for 15 minutes with frequent agitation. Filter into the volumetric flask, and wash the beaker and the filter with small portions of cold water, receiving the washings in the same flask. Add water to the 250-cc. mark, and mix well. Transfer an accurately measured aliquot of the solution, equivalent to about 1 Gm. of ferric ammonium citrate, to a beaker, add 5 cc. of hydrochloric acid and 10 cc. of hydrogen peroxide T.S., and evaporate to dryness on a steam bath. Dissolve the residue in 25 cc. of water and 5 cc. of hydrochloric acid, and transfer the solution completely to a glass-stoppered flask with the aid of 25 cc. of water. Add to the solution 4 Gm. of potassium iodide, stopper the flask, and allow to stand for 15 min-

utes in the dark. Dilute with 50 cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. toward the end of the titration. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 5.585 mg. of Fe.

Storage—Preserve Ferric Ammonium Citrate Capsules in well-closed containers.

Sizes—Ferric Ammonium Citrate Capsules usually available contain the following amount of ferric ammonium citrate: 500 mg. (7½ grains).

AVERAGE DOSE OF FERRIC AMMONIUM CITRATE—**1 Gm.** (approximately 15 grains).

Ferrous Sulfate

FERROUS SULFATE

Ferri Sulfas

Ferr. Sulf.—Iron Sulfate

$FeSO_4.7H_2O$ Mol. wt. 278.02

Ferrous Sulfate contains not less than 54.36 and not more than 57.07 per cent of anhydrous ferrous sulfate ($FeSO_4$), corresponding to not less than 99.5 per cent of the hydrated salt ($FeSO_4.7H_2O$).

Description—Ferrous Sulfate occurs as pale, bluish green crystals or granules. It is odorless, has a saline, styptic taste, and is efflorescent in dry air. Its solutions are acid to litmus paper. On exposure to moist air, the crystals rapidly oxidize and become coated with brownish yellow basic ferric sulfate. When Ferrous Sulfate has thus deteriorated, it must not be used.

Solubility—One Gm. of Ferrous Sulfate dissolves in 1.5 cc. of water, and in 0.5 cc. of boiling water. It is insoluble in alcohol.

Identification—Ferrous Sulfate responds to the tests for *Ferrous salts*, page 660, and for *Sulfate*, page 663.

Free acid—Agitate 1 Gm. of Ferrous Sulfate, in small fragments, during 5 minutes with 10 cc. of alcohol, and filter the mixture: the filtrate does not immediately redden moistened blue litmus paper.

Heavy metals—Dissolve 250 mg. of Ferrous Sulfate in 40 cc. of recently boiled, cooled water containing 1 cc. of diluted sulfuric acid, and filter if necessary. Prepare a control solution by adding 2 cc. of standard lead solution, page 657 (equivalent to 20 micrograms Pb), to 10 cc. of this solution, and dilute to 30 cc. with water. Add 10 cc. of hydrogen sulfide T.S. to the control solution and also to the remaining 30 cc. of the original Ferrous Sulfate solution, mix well, and compare immediately. The color in the original Ferrous Sulfate solution is no darker than that in the control solution.

Assay—Dissolve about 1 Gm. of Ferrous Sulfate, accurately weighed, in 25 cc. of diluted sulfuric acid and 25 cc. of water, and titrate with tenth-normal potassium permanganate until a permanent pink color is produced. Each cc. of tenth-normal potassium permanganate is equivalent to 15.19 mg. of $FeSO_4$.

Packaging and storage—Preserve Ferrous Sulfate in tight containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Ferrous Sulfate, Exsiccated

EXSICCATED FERROUS SULFATE

Ferri Sulfas Exsiccatus

Ferr. Sulf. Exsic.—Dried Ferrous Sulfate

Exsiccated Ferrous Sulfate contains not less than 80 per cent of anhydrous ferrous sulfate ($FeSO_4$).

Description—Exsiccated Ferrous Sulfate is a grayish white powder.

Solubility—Exsiccated Ferrous Sulfate dissolves slowly in water. It is insoluble in alcohol.

Identification—Exsiccated Ferrous Sulfate responds to the tests for *Ferrous Salts*, page 660, and for *Sulfate*, page 663.

Insoluble matter—A solution of Exsiccated Ferrous Sulfate (1 in 20) in recently boiled and cooled water is not more than slightly turbid.

Heavy metals—To 500 mg. of Exsiccated Ferrous Sulfate add 10 cc. of water and 4 cc. of tenth-normal hydrochloric acid, and warm for a few minutes on a steam bath. Dilute with water to 40 cc., filter, add to the filtrate 50 mg. of hydroxylamine hydrochloride, and boil for 1 minute. Cool, and dilute with water to 50 cc. To 25 cc. add 10 cc. of hydrogen sulfide T.S.: the color produced is not darker than that of a control prepared as follows:

To 4 cc. of standard lead solution, page 657, add 2 cc. of tenth-normal hydrochloric acid, 10 cc. of water, and 25 mg. of hydroxylamine hydrochloride, and boil for 1 minute. Cool, dilute with water to 25 cc., and add 10 cc. of hydrogen sulfide T.S.

Assay—Dissolve about 800 mg. of Exsiccated Ferrous Sulfate, accurately weighed, in 25 cc. of diluted sulfuric acid and 25 cc. of water, and titrate with tenth-normal potassium permanganate until a permanent pink color is produced. Each cc. of tenth-normal potassium permanganate corresponds to 15.19 mg. of $FeSO_4$.

Packaging and storage—Preserve Exsiccated Ferrous Sulfate in well-closed containers.

AVERAGE DOSE—**0.2 Gm.** (approximately 3 grains).

Ferrous Sulfate Tablets

FERROUS SULFATE TABLETS

Tabellæ Ferri Sulfatis

Tab. Ferr. Sulf.

Ferrous Sulfate Tablets contain not less than 95 per cent and not more than 110 per cent of the labeled amount of $FeSO_4.7H_2O$. An equivalent amount of exsiccated ferrous sulfate may be used in place of $FeSO_4.7H_2O$, in preparing the Tablets.

Identification—Dissolve a quantity of the powdered Tablets, equivalent to about 0.25 Gm. of ferrous sulfate, in sufficient water, acidified with hydrochloric acid, to make 25 cc. of solution. The solution responds to the tests for *Ferrous salts*, page 660, and for *Sulfate*, page 663.

Assay—Weigh a counted number of not less than 20 Ferrous Sulfate Tablets, and crush them well without appreciable loss. Weigh accurately a portion of the

crushed Tablets, equivalent to about 500 mg. of ferrous sulfate, in a beaker, and dissolve in a mixture of 20 cc. of diluted sulfuric acid and 80 cc. of freshly boiled and cooled water. Filter the solution rapidly as soon as all soluble ingredients in the tablets are dissolved, and wash the beaker and filter with small portions of a mixture of 20 cc. of diluted sulfuric acid and 80 cc. of water. Then titrate immediately the combined filtrate and washings with tenth-normal ceric sulfate, using from 0.1 to 0.2 cc. of orthophenanthroline T.S. as the indicator. Each cc. of tenth-normal ceric sulfate is equivalent to 27.80 mg. of $FeSO_4.7H_2O$.

Storage—Preserve Ferrous Sulfate Tablets in tight containers.

Sizes—Ferrous Sulfate Tablets usually available contain the following amount of ferrous sulfate: 300 mg. (5 grains).

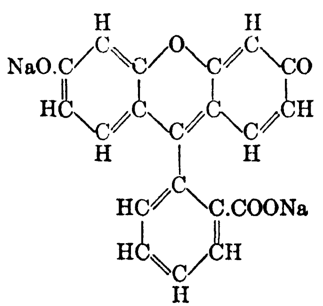
AVERAGE DOSE OF FERROUS SULFATE—0.3 Gm. (approximately 5 grains).

Fluorescein Sodium

FLUORESCEIN SODIUM

Fluoresceinum Sodicum

Fluoresc. Sod.—Soluble Fluorescein, Resorcinolphthalein Sodium



$C_{20}H_{10}O_5Na_2$ **Mol. wt. 376.27**

Fluorescein Sodium, when dried to constant weight at 105°, contains not less than 98.5 per cent of $C_{20}H_{10}O_5Na_2$.

Description—Fluorescein Sodium is an orange red, odorless powder. It is hygroscopic.

Solubility—Fluorescein Sodium is freely soluble in water and sparingly soluble in alcohol.

Identification—

A: A solution of Fluorescein Sodium is strongly fluorescent, even in extreme dilution; the fluorescence disappears when the solution is made acid, and reappears when the solution is again made alkaline.

B: The residue remaining after the incineration of Fluorescein Sodium responds to the tests for *Sodium*, page 663.

C: Place 1 drop of a solution of Fluorescein Sodium (1 in 2000) upon a piece of filter paper: a yellow spot is produced, which, when exposed while moist to the vapor of bromine for 1 minute and then to ammonia vapor, becomes deep pink in color.

Loss on drying—When dried to constant weight at 105°, Fluorescein Sodium loses not more than 7 per cent of its weight.

Zinc—Dissolve 100 mg. of Fluorescein Sodium in 10 cc. of a saturated solution of reagent sodium chloride, add 2 cc. of diluted hydrochloric acid, shake well, filter, and add 1 cc. of potassium ferrocyanide T.S. to the filtrate: no turbidity is produced.

Acriflavine—Dissolve 10 mg. of Fluorescein Sodium in 5 cc. of water, and add a few drops of a solution of sodium salicylate (1 in 10): no precipitate appears in the mixture.

Assay—Weigh accurately about 500 mg. of Fluorescein Sodium, previously dried to constant weight at 105°, and dissolve it in a separator in 20 cc. of water. Add 5 cc. of diluted hydrochloric acid, and extract the precipitated fluorescein with four 20-cc. portions of a mixture of equal volumes of isobutyl alcohol and chloroform. Wash the combined extract with 10 cc. of water, re-extract the water-washing with 5 cc. of the isobutyl alcohol-chloroform mixture, and add it to the main extract. Evaporate the extract to dryness on a steam bath with the aid of a current of air, then dissolve the residue in 10 cc. of alcohol, re-evaporate to dryness on a steam bath, and finally dry at 105° for 1 hour. The weight of the fluorescein so obtained, multiplied by 1.132, represents the weight of $C_{20}H_{10}O_5Na_2$.

Packaging and storage—Preserve Fluorescein Sodium in tight containers.

Formaldehyde Solution

FORMALDEHYDE SOLUTION

Liquor Formaldehydi

Liq. Formaldehyd.

Formaldehyde Solution contains not less than 37 per cent of HCHO, with variable amounts of methanol to prevent polymerization.

Description—Formaldehyde Solution is a clear, colorless or nearly colorless liquid, having a pungent odor. The vapor from Formaldehyde Solution irritates the mucous membrane of the throat and nose. On long standing, especially in the cold, Formaldehyde Solution sometimes becomes cloudy, due to the separation of paraformaldehyde.

Solubility—Formaldehyde Solution is miscible with water and with alcohol.

Identification—

A: Dilute 2 cc. of Formaldehyde Solution with 10 cc. of water in a test tube, and add 1 cc. of silver ammonium nitrate T.S.: metallic silver is produced either in the form of a finely divided, gray precipitate, or as a bright, metallic mirror on the sides of the test tube.

B: Add 2 drops of Formaldehyde Solution to 5 cc. of sulfuric acid in which about 20 mg. of salicylic acid has been dissolved, and warm the liquid very gently: a permanent, deep red color appears.

Acid—Measure 20 cc. of Formaldehyde Solution into a flask containing 20 cc. of water, add 2 drops of bromothymol blue T.S., and titrate with normal sodium hydroxide: not more than 1 cc. of the sodium hydroxide is consumed.

Assay—Transfer about 3 cc. of Formaldehyde Solution to a tared flask containing 10 cc. of water, stopper the flask tightly, and determine the exact weight of the Solution taken. Add 50 cc. of normal sodium hydroxide, and follow this immediately but slowly, through a small funnel, with 50 cc. of hydrogen peroxide T.S. that has been previously neutralized to bromothymol blue T.S. with normal sodium hydroxide. Heat the mixture cautiously on a water bath for 5 minutes, shaking it occasionally. Allow the mixture to cool, rinse the funnel and inner wall of the flask with water, and after allowing it to stand for 30 minutes, add from 2 to 5 drops of bromothymol blue T.S., and titrate the excess of alkali with normal sulfuric acid. Each cc. of normal sodium hydroxide is equivalent to 30.03 mg. of HCHO.

Packaging and storage—Preserve Formaldehyde Solution in tight containers, preferably at a temperature not below 25°.

Gas Gangrene Antitoxin, Bivalent

BIVALENT GAS GANGRENE ANTITOXIN

Antitoxinum Gas-gangrænosum Bivalens

Antitox. Gas-gangræn. Bival.

Bivalent Gas Gangrene Antitoxin is a sterile solution of antitoxic substances obtained from the blood of healthy animals, which have been immunized against *Clostridium perfringens* and *Clostridium septicum* toxins. Each package of Bivalent Gas Gangrene Antitoxin contains not less than 10,000 antitoxic units of each of the component antitoxins. Bivalent Gas Gangrene Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Bivalent Gas Gangrene Antitoxin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight granular deposit. It must be free from harmful substances detectable by animal inoculation and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The potency of the Antitoxin shall be expressed in antitoxic units and the units shall be those of the Perfringens Antitoxin and the Vibrion septique Antitoxin prescribed by the National Institute of Health of the United States Public Health Service.

The outside label must indicate the minimum number of antitoxic units of each antitoxin in the package, the manufacturer's lot number of the Antitoxin, the name, address, and license number of the manufacturer, the genus of animal employed

when other than the horse, and the date beyond which the minimum potency of the contents, as declared on the label, may not be maintained.

Preservation and storage—Preserve Bivalent Gas Gangrene Antitoxin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, or prophylactic, the contents of one or more packages as the initial dose.

Gas Gangrene Antitoxin, Pentavalent

PENTAVALENT GAS GANGRENE ANTITOXIN

Antitoxinum Gas-gangrænosum Pentavalens

Antitox. Gas-gangræn. Pentaval.

Pentavalent Gas Gangrene Antitoxin is a sterile solution of antitoxic substances obtained from the blood of healthy animals which have been immunized against the toxins of *Clostridium perfringens*, *Clostridium septicum*, *Clostridium œdematiens* (Novyi), *Clostridium bifermentans* (Sordelli), and *Clostridium histolyticum*. Each package of Pentavalent Gas Gangrene Antitoxin contains not less than 10,000 units each of Clostridium perfringens and Clostridium septicum antitoxins, 3,000 units of Clostridium histolyticum antitoxin, and 1500 units each of Clostridium œdematiens (Novyi) and Clostridium bifermentans (Sordelli) antitoxins. Pentavalent Gas Gangrene Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Pentavalent Gas Gangrene Antitoxin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight granular deposit. It must be free from harmful substances detectable by animal inoculation and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The potency of the Antitoxin shall be expressed in antitoxic units and the units shall be those of the Perfringens, Vibrion septique, Odematiens, Sordelli, and Histolyticum Antitoxins prescribed by the National Institute of Health of the United States Public Health Service.

The outside label must indicate the minimum number of antitoxic units of each antitoxin in the package, the manufacturer's lot number of the Antitoxin, the name, address, and license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained.

Preservation and storage—Preserve Pentavalent Gas Gangrene Antitoxin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, or prophylactic, the contents of one or more packages as the initial dose.

Gas Gangrene Antitoxin, Trivalent

TRIVALENT GAS GANGRENE ANTITOXIN

Antitoxinum Gas-gangrænosum Trivalens

Antitox. Gas-gangræn. Trival.

Trivalent Gas Gangrene Antitoxin is a sterile solution of antitoxic substances obtained from the blood of healthy animals which have been immunized against the toxins of *Clostridium perfringens, Clostridium septicum* and *Clostridium œdematiens* (Novyi). Each package of Trivalent Gas Gangrene Antitoxin contains not less than 10,000 units of Clostridium perfringens and Clostridium septicum antitoxins and 1500 units of Clostridium œdematiens (Novyi) antitoxin. Trivalent Gas Gangrene Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Trivalent Gas Gangrene Antitoxin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight granular deposit. It must be free from harmful substances detectable by animal inoculation and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The potency of the Antitoxin shall be expressed in antitoxic units and the units shall be those of the Perfringens, Vibrion septique and Odematiens Antitoxins prescribed by the National Institute of Health of the United States Public Health Service.

The outside label must indicate the minimum number of antitoxic units of each antitoxin in the package, the manufacturer's lot number of the Antitoxin, the name, address, and license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the minimum potency of the contents, as declared on the label, may not be maintained.

Preservation and storage—Preserve Trivalent Gas Gangrene Antitoxin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

Average dose—Parenteral, therapeutic, or prophylactic, the contents of one or more packages as the initial dose.

Gauze, Absorbent

ABSORBENT GAUZE

Carbasus Absorbens

Carbas. Absorb.—Gauze, Plain Gauze, Non-sterilized Absorbent Gauze

Absorbent Gauze consists of well bleached cotton cloth of plain weave.

Description—Absorbent Gauze is white cotton cloth of various thread counts and weights. The following table gives the commercial designations in type and in terms of thread-count and the standard weight in grams per linear yard. It also

gives the width of the gauze in inches. A variation of $\pm\frac{1}{2}$ inch shall be allowed in width.

Type	Threads per 25.4 mm. (1 Inch) Warp	Filling	Standard Weight, Gm. per Linear Yard	Width in Inches
I	44	36	44.5	38.5
II	32	28	31.3	36
III	28	24	27.0	36
IV	24	20	23.2	36
V	22	18	21.5	36
VI	20	16	18.8	36
VII	20	12	17.2	36

All Absorbent Gauze shall be conditioned for at least 4 hours in a standard atmosphere of 65 per cent, ±2 per cent, relative humidity at 21°, ±1.1° (70° F., ±2° F.), before making any measurements thereon, and the weight and thread-count shall be determined under these atmospheric conditions. The Absorbent Gauze must be removed from its wrappings before being placed in the conditioning atmosphere, and if in the form of bolts or rolls, the quantity necessary for the various tests shall be cut from the piece, excluding the first two and the last two yards when the total quantity of Gauze available permits of so doing.

NOTE—Absorbent Gauze which complies with all of the other requirements of the Pharmacopœia may be dyed with a non-toxic dye of low-reflecting capacity.

Thread count—Determine the number of warp and of filling threads of Absorbent Gauze by counting the actual number of threads in 76.2 mm. (3 inches) of width in each direction at three different places in the cloth, if possible, making the count no nearer any edge than one-tenth of the dimension of the fabric and not including the same threads in any two counts. If either dimension of the piece does not exceed 76.2 mm. (3 inches), the entire number of threads shall be counted in that dimension in three different places in the piece.

A variation in the average count of 3 threads to the inch in the warp and 3 threads to the inch in the filling, but not more than 4 threads to the square inch, is allowed in 44 x 36 gauze. A variation in the average count of 2 threads to the inch in the warp and 2 threads to the inch in the filling, but not more than 3 threads to the square inch is allowed in 32 x 28, 28 x 24, 24 x 20, 22 x 18, 20 x 16, and 20 x 12 gauze.

Weight—Determine the weight of Absorbent Gauze by weighing a piece exactly 91.4 cm. long, including the entire width of the piece, or if the dimensions are less than 91.4 cm. by 91.4 cm., weigh the entire piece and calculate the weight of exactly 0.836 square meter (1 linear yard). In the case of Type I Gauze, calculate the weight of exactly 0.894 square meter (1 linear yard).

A variation of ±8 per cent in the standard weight is allowed when the length of the gauze, the piece being of full width, is more than 1 yard, and a variation of ±12 per cent when the piece is less than this quantity in either dimension.

Residue on ignition—Place about 5 Gm. of Absorbent Gauze, accurately weighed, in a porcelain or platinum dish, and moisten with diluted sulfuric acid. Gently heat the mixture until it is charred, then ignite more strongly until the carbon is completely consumed: the weight of the residue corresponds to not more than 0.15 per cent of the weight of the Gauze.

Absorbency—Fold about 90 cm. (about 1 yard) of Absorbent Gauze into a 10 cm. (4 inch) square, and lightly join the loose ends with a No. 30 to No. 60 white cotton thread. Hold the folded Gauze horizontally almost in contact with the surface of water at 25° and allow it to drop lightly upon the water: not more than 30 seconds are required for complete submersion.

Water extract—Place 20 Gm., ±100 mg., of Absorbent Gauze in 500 cc. of water, and boil the mixture for 15 minutes, adding boiling water as necessary to maintain the original volume. Pour the water through a funnel into a 1000-cc. volumetric flask, transfer the Absorbent Gauze to the funnel, press out the excess water with a glass rod, and wash it with two successive 250-cc. portions of boiling water, pressing the gauze after each washing. Combine the washings and make the total volume measure 1000 cc. Evaporate 400 cc. of the extract, filtered if necessary,

in a suitable dish on a water bath, and dry the residue to constant weight at 105°: the weight of the residue, multiplied by 2.5, corresponds to not more than 0.25 per cent of the weight of the Gauze. Ignite the residue to constant weight in a muffle furnace at a dull-red heat: the weight of the residue, multiplied by 2.5, corresponds to not more than 0.075 per cent of the weight of the Gauze.

Acid or alkali—Divide the remaining 600 cc. of the water extract into three equal portions. Add to one portion 3 drops of phenolphthalein T.S. and to another portion 1 drop of methyl orange T.S.: no pink color develops in either portion.

Dextrin or starch—To the third portion of the water extract add 1 drop of iodine T.S.: no red, violet, or blue color develops.

Fatty matter—Pack 10 Gm., ±10 mg., of Absorbent Gauze in a Soxhlet extractor, and extract with ether, adjusting the temperature so that the ether will siphon over not less than four times per hour in the tared flask of the extraction apparatus, and continuing the extraction for 5 hours. The ether extract in the flask shows no trace of blue, green or brownish color. Evaporate the extract to dryness, and dry to constant weight at 105°: the weight of the residue does not exceed 70 mg.

Uncombined dyes—Pack 10 Gm. of Absorbent Gauze in a narrow percolator, and extract slowly with alcohol until the percolate measures 50 cc.: when observed downward in a column 20 cm. in depth, the percolate may show a yellowish color, but neither a blue nor a green tint.

Packaging and storage—Preserve Absorbent Gauze in well-closed containers.

Labeling—The type, thread count, length, and width of the Gauze must be stated on the container, and the designation "*unsterilized*" or "*not sterilized*" must appear prominently thereon.

auze, Absorbent, Adhesive

ADHESIVE ABSORBENT GAUZE

Carbasus Absorbens Adhæsiva

Carbas. Absorb. Adhaes.—Adhesive Absorbent Compress, Adhesive Bandage

Description—Adhesive Absorbent Gauze is a sterile individual dressing prepared by affixing a plain absorbent compress to a strip of film or fabric coated with a pressure-sensitive adhesive composition. The compress is composed of layers of absorbent gauze or of other absorbent cellulosic material covered with absorbent gauze. One or more colors or bacteriostatic agents or both, if nontoxic and harmless in the concentration employed, may be added to the compress. The weight of the compress is not less than that of a compress of the same area composed of four layers of Type I *Absorbent Gauze*, page 229. The absorbent gauze is substantially free from loose threads or ravelings. The adhesive strip may be perforated over the compress, and the back may be coated with a water-repellent film.

The adhesive surface is protected by overlapping strips of crinoline or other protective material of a width not less than that of the dressing.

Sterility—Adhesive Absorbent Gauze meets the requirements of the *Sterility Tests for Solids*, page 689.

Packaging and storage—Each Adhesive Absorbent Gauze is packaged individually in such manner that sterility is maintained until the individual package is opened. One or more individual packages are packed in a second protective container.

Labeling—The label of the second protective container shall bear a statement that the sterility of the Adhesive Absorbent Gauze cannot be guaranteed if the individual package has been damaged or previously opened. If the compress is colored with a dye which is not claimed to be a bacteriostatic agent, the label shall bear a statement that the compress is colored, but the coloring agent does not render the Gauze antiseptic. If the compress contains one or more bacteriostatic agents, the label shall bear the name of each such agent.

Gauze, Absorbent, Sterile

STERILE ABSORBENT GAUZE

Carbasus Absorbens Sterilis

Carbas. Absorb. Steril.—Sterile Gauze

Sterile Absorbent Gauze is absorbent gauze which has been rendered sterile and protected from contamination.

Description—Sterile Absorbent Gauze complies with the definition, description, and tests under *Absorbent Gauze*, page 228. Sterile Absorbent Gauze may be supplied in various lengths and widths, and in the form of rolls or folds.

Dimensions—The dimensions of Sterile Absorbent Gauze shall be not less than 98 per cent of the labeled dimensions of the Gauze.

Sterility—Sterile Absorbent Gauze meets the requirements of the *Sterility Tests for Solids*, page 689.

Packaging and storage—Each Sterile Absorbent Gauze unit shall be so packaged individually that the sterility of the unit is maintained until the package is opened for use. Sterile Absorbent Gauze shall be sterilized in the package.

Labeling—The package shall bear a statement to the effect that the sterility of the Gauze cannot be guaranteed if the package bears evidence of damage or has been previously opened. The length, width, and type of the gauze shall be stated upon the package.

Gauze Bandage

GAUZE BANDAGE

Ligamentum Carbasi Absorbentis

Lig. Carbas. Absorb.—Roller Gauze Bandage

Description—Gauze Bandage is prepared from type I absorbent gauze in various widths and lengths, and sterilized. Each bandage is in one continuous piece, tightly rolled, and substantially free from loose threads and ravelings.

Before determining the thread count, dimensions, and weight, all Gauze Bandage shall be unrolled and conditioned for at least 4 hours in a standard atmosphere of 65 per cent ±2 per cent relative humidity, at 21° ±1.1° (70°F. ±2°F.).

Thread count—Count the number of warp and filling threads in areas of 1.27 cm. (½ inch) square at 5 points evenly spread along the center line of the bandage, no point being within 30.5 cm. (12 inches) of either end of the bandage, and calculate the number of threads per 2.54 cm. (1 inch) in each direction. A variation of not more than 3 threads per inch is allowed in either warp or filling, provided that the combined variations do not exceed 5 threads per square inch.

Width—Measure the width of the Gauze Bandage at each of the 5 points selected for the determination of the thread count: the average of 5 measurements is not more than 1.6 mm. (1/16 inch) less than the labeled width of the bandage.

Length—Measure the length of the unrolled Gauze Bandage, smoothed without tension, along the center line of the Gauze Bandage: the length is not less than 98 per cent of the labeled length of the bandage.

Weight—Weigh the entire bandage: the calculated weight in Gm. per 0.894 square meter (1 linear yard *Type I gauze*), using the measurements obtained as described in the two paragraphs just preceding, is not less than 39.2 Gm.

Absorbency—Hold a rolled Gauze Bandage horizontal to and almost in contact with

the surface of water at 25°, and allow it to drop lightly upon the water: it requires not more than 30 seconds for complete submersion.

Other requirements—Gauze Bandage meets the requirements of the tests for *Residue on ignition*, *Water extract*, *Acid or alkali*, *Dextrin or starch*, *Dyes*, and *Fatty matter* under *Absorbent Gauze*, page 228.

Sterility—Gauze Bandage meets the requirements of the *Sterility Tests for Solids*, page 689.

Packaging and storage—Each Gauze Bandage shall be so packaged individually that the sterility of the product is maintained until the package is opened for use. Gauze Bandage shall be sterilized in the package.

Labeling—The package shall bear a statement to the effect that the sterility of the Bandage cannot be guaranteed if the package bears evidence of damage, or if the package has been previously opened. The width and length of the bandage shall be stated on the package.

Gelatin

GELATIN

Gelatinum

Gelat.

Gelatin is a product obtained by the partial hydrolysis of collagen, derived from the skin, white connective tissue, and bones of animals. Gelatin derived from an acid-treated precursor exhibits an isoelectric point between pH 7 and pH 9, while Gelatin derived from an alkali-treated precursor has an isoelectric point between pH 4.7 and pH 5.

Description—Gelatin occurs in sheets, flakes, shreds, or as a coarse or fine powder. It is white or yellowish, and has a very slight, characteristic bouillon-like odor and taste. It is stable in air when dry, but is subject to microbic decomposition when moist or in solution.

Solubility—Gelatin is insoluble in cold water, but swells and softens when immersed in it, gradually absorbing from 5 to 10 times its own weight of water. It is soluble in hot water, in acetic acid, and in a hot mixture of glycerin and water. It is insoluble in alcohol, in chloroform, in ether, and in fixed and volatile oils.

Identification—

A: A solution of Gelatin (1 in 100) yields a precipitate with a solution of chromium trioxide, and with trinitrophenol T.S.

B: A solution of Gelatin (1 in 5000) is at once rendered turbid by the addition of tannic acid T.S.

Residue on ignition—Incinerate 1.00 Gm. of Gelatin without the use of sulfuric acid: the weight of the residue does not exceed 20 mg.

Odor and water-insoluble substances—A hot solution of Gelatin in water (1 in 40) is free from any disagreeable odor, and when viewed in a layer 2 cm. thick is only slightly opalescent.

Sulfite—Dissolve 20 Gm. of Gelatin in 150 cc. of hot water in a flask having a round bottom and a long neck, add 5 cc. of phosphoric acid and 1 Gm. of sodium bicarbonate, and at once connect the flask with a condenser. Distil 50 cc., receiving the distillate under the surface of 50 cc. of tenth-normal iodine. Acidify the distillate with a few drops of hydrochloric acid, add 2 cc. of barium chloride T.S., and heat on a water bath until the liquid is nearly colorless. The precipitate of barium sulfate, if any, when filtered, washed, and ignited, weighs not more than 3 mg., corresponding to not more than 0.004 per cent of sulfur dioxide, correction being made for any sulfate which may be present in 50 cc. of the tenth-normal iodine.

Arsenic—Heat 15 Gm. of Gelatin with 60 cc. of dilute, arsenic-free hydrochloric acid (1 in 4) in a covered flask until all insoluble matter is flocculated and the Gelatin dissolved. Add an excess of bromine T.S. (about 15 cc.), and heat until the excess of bromine is expelled, neutralize with ammonia T.S., add 1.5 Gm. of sodium phosphate, and allow to cool. Add a slight excess (about 30 cc.) of magnesia mixture T.S., allow to stand for 1 hour, filter, and wash with five 10-cc. portions of ammonia T.S. diluted with 3 volumes of water. Drain the precipitate well, and dissolve it in dilute hydrochloric acid (1 in 4) to a volume of exactly 50 cc. Subject 5 cc. of this solution to the test for *Arsenic*, page 618. The stain, if any, is not more intense than that produced in a test made with similar quantities of the same reagents and 1.5 cc. of the standard arsenic test solution (1 part per million).

Heavy metals—To the residue obtained in the test for *Residue on ignition* add 2 cc. of hydrochloric acid and 0.5 cc. of nitric acid, and evaporate the mixture to dryness on a steam bath. Add to the residue 1 cc. of normal hydrochloric acid and 15 cc. of water, and warm for a few minutes. Filter, and wash with sufficient water to make the filtrate measure 50 cc. To 25 cc. of the filtrate, add 10 cc. of hydrogen sulfide T.S.: the heavy metals limit, page 657, for Gelatin is 50 parts per million.

Gel strength—Place 1 Gm. of Gelatin, accurately weighed, and 99 cc. of water in a 200-cc. flask, allow to stand for 15 minutes, then place the flask in a water bath at 60° and swirl occasionally until solution is complete. Transfer 10 cc. of the solution to a test tube having an internal diameter of 12 mm., and place the tube in an ice bath, making certain that the top of the solution is below the level of the ice and water. Place the bath containing the tube in a refrigerator, and maintain it at about 0° for 6 hours. When the tube is removed from the bath and inverted, no movement of the gel is observed.

Bacterial content—When examined as directed under *Bacteriological Examination of Gelatin*, page 621, the total bacterial count in Gelatin does not exceed 10,000 per Gm., and *Escherichia coli* is not present in 10 mg. or less.

NOTE—Gelatin to be used in the manufacture of capsules in which to dispense medicines, or for the coating of pills, may be colored with a certified dye and contain not more than 0.15 per cent of sulfur dioxide and may have a lower gel strength. For the special Gelatin to be used in the preparation of emulsions, see *Emulsions*, page 643.

Packaging and storage—Preserve Gelatin in well-closed containers in a dry place.

Gelatin, Glycerinated

GLYCERINATED GELATIN

Gelatinum Glycerinatum

Gelat. Glycerin.

GELATIN	500 Gm.
GLYCERIN	500 Gm.
DISTILLED WATER, a sufficient quantity,	
To make	1000 Gm.

Pour upon the gelatin sufficient distilled water to cover it, allow it to stand for 1 hour, pour off the water, and allow the gelatin to drain for a few minutes. Then transfer it to a dish, add the glycerin, and heat on a water bath until the gelatin is dissolved. Strain the solution while hot,

fibrous, starchy and resinous; internally yellowish brown to yellowish orange; odor agreeably aromatic; taste aromatic and pungent.

Unground African Ginger—Cork partly removed on the flattened sides, leaving light brownish areas; portions with cork longitudinally or reticulately wrinkled and grayish brown; internally light yellow to brown; taste aromatic and strongly pungent; otherwise resembling Jamaica Ginger.

Unground Cochin Ginger—Cork partially or wholly removed on the flattened sides; light brown to yellowish gray; fracture shorter, less fibrous and more starchy than the other varieties; internally weak yellow to medium yellow; odor aromatic; taste pungent.

Histology—Chiefly thin-walled, starch-bearing parenchyma cells, numerous scattered secretion cells and small vascular bundles, the latter very numerous and adjacent to the inner face of the narrow endodermis and separating the narrow cortex from the broad central cylinder; secretion cells mostly similar in size and shape to the parenchyma cells and with greenish yellow to orange oil or oleoresin or brown to reddish brown resin; vascular bundles closed collateral with few tracheæ, small phloem cells and usually accompanied by fibers lying on the inner face of or completely surrounding the vascular tissues; cork of several to many rows of cells in African Ginger.

Powdered Ginger—Weak yellowish orange (Jamaica Ginger), light yellowish brown to moderate yellow (African and Cochin Ginger); starch grains numerous, from 5 to 40 microns in diameter, occasionally up to 60 microns in the long axis, nearly spherical, ovoid, ellipsoidal or pear-shaped, frequently with a characteristic beak, slightly lamellated, the hilum excentric and near the smaller end; fibers long, with rounded, pointed or notched ends, thin-walled, non-lignified or slightly lignified, with oblique pores and, where they join the parenchyma, distinctly undulate; long fiber-like cells with suberized walls and brown to dark brownish red, resin-like contents occasionally present; tracheæ spiral, reticulate or scalariform and frequently non-lignified; numerous greenish yellow to reddish brown secretion cells with oil or resin content; yellowish or brownish cork cells, thin-walled, occasionally in Jamaica Ginger and scraped Cochin Ginger, fairly numerous in unscraped Cochin Ginger and in African Ginger.

Assay for cold-water extractive—Place 4 Gm. of ground Ginger in a 200-cc. flask, fill to the mark with water, and agitate at 30-minute intervals during 8 hours. Allow the mixture to stand for 16 hours, and filter. Evaporate 50 cc. of the filtrate, representing 1 Gm. of the drug, on a water bath, and dry the residue to constant weight at 100°.

Assay for ether-soluble extractive—Place 20 Gm. of Ginger, in fine powder, and accurately weighed, in an extraction thimble of a Soxhlet or similar extractor, and extract with ether for 6 hours. Evaporate the ether extract on a steam bath until the odor of ether is no longer perceptible, then dry the residue in a desiccator over sulfuric acid for 18 hours: the weight of the extract so obtained is not less than 900 mg.

AVERAGE DOSE—**0.6 Gm.** (approximately 10 grains).

Ginger Fluidextract

GINGER FLUIDEXTRACT

Fluidextractum Zingiberis

Fldext. Zingib.

Ginger Fluidextract yields, from each 100 cc., not less than 4.5 Gm. of ether-soluble extractive.

GINGER, in moderately coarse powder................ 1000 Gm.

Prepare a fluidextract by Process A, page 654, using a mixture of 9 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug over night, and percolate at a moderate rate.

Assay—Place 20 cc. of Ginger Fluidextract in a 200-cc. beaker, and evaporate on a water bath until there is no longer any odor of alcohol. Remove the beaker from the bath, and add 50 cc. of ether. Stir the contents of the beaker with a stirring rod to dissolve the soluble resin, and decant the ether through a dry, 9-cm. filter into a tared, 200-cc. beaker. Repeat the extraction two or three times, using 50-cc. portions of ether. Wash the filter with a small amount of ether, and evaporate the combined ether extracts on a water bath until the odor of ether is no longer perceptible. Finally dry in a desiccator over sulfuric acid for 18 hours, and then weigh. The weight of the residue is not less than 900 mg.

Packaging and storage—Preserve Ginger Fluidextract in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol content—From 69 to 76 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—**0.6 cc.** (approximately 10 minims).

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Globulin, Human Immune

HUMAN IMMUNE GLOBULIN

Globulinum Immune Humanum

Glob. Immun. Human.

Human Immune Globulin is a sterile solution of antibodies obtained from the placental blood and the placentæ expelled by healthy women (*Homo sapiens*). Each preparation shall be composed of a pool from at least ten individuals. Human Immune Globulin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Human Immune Globulin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color. It is nearly odorless or has an odor due to the presence of a preservative; it may have a slight, granular deposit. Human Immune Globulin must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or not more than 0.4 per cent of cresol if either of these is used).

Regulations—The outside label must bear the name *Human Immune Globulin*, the manufacturer's lot number of the Globulin, the name, address, and license number of the manufacturer, and the date beyond which the minimum potency of the contents, as declared on the label, may not be maintained.

Packaging and storage—Preserve Human Immune Globulin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intramuscular,
For modification, 2 to 5 cc. (approximately 30 to 75 minims).
For prevention, 2 to 10 cc. (approximately 30 to 150 minims).

Glucose, Liquid

LIQUID GLUCOSE

Glucosum Liquidum

Glucos. Liq.—Glucose

Liquid Glucose is a product obtained by the incomplete hydrolysis of starch. It consists chiefly of dextrose (*d*-glucose, $C_6H_{12}O_6$), with dextrins, maltose, and water.

Description—Liquid Glucose is a colorless or yellowish, thick, syrupy liquid. It is odorless, or nearly so, and has a sweet taste.

Solubility—Liquid Glucose is very soluble in water, but is sparingly soluble in alcohol.

Identification—Add a few drops of a solution of Liquid Glucose (1 in 20) to 5 cc. of hot alkaline cupric tartrate T.S.: a copious, red precipitate of cuprous oxide appears (distinction from *sucrose*).

Acid—A solution of 5 Gm. of Liquid Glucose in 15 cc. of water, mixed with 5 drops of phenolphthalein T.S., requires not more than 0.6 cc. of tenth-normal sodium hydroxide to produce a pink color.

Loss on drying—Weigh accurately about 5 Gm. of Liquid Glucose, add sufficient water to make exactly 50 cc., and mix well. Place about 25 Gm. of dry sand and a short stirring rod in a weighing bottle of 50 to 60 mm. internal diameter and about 40 mm. in depth, and dry the open bottle with the stopper at 100° for 2 hours. Immediately stopper the weighing bottle, cool in a desiccator over sulfuric acid, and weigh. From a transfer pipette add exactly 10 cc. of the Liquid Glucose solution in such manner as to distribute it over the entire surface of the sand. Mix well with the glass rod, heat on a steam bath for 30 minutes, stirring at intervals of 2 or 3 minutes, until the mixture becomes too viscous to stir readily. Then dry at 100° for 4 hours, cool in the desiccator, and weigh. Repeat the drying at 100° for periods of 2 hours, until two successive weighings differ by not more than 2 mg. The loss in weight of the Liquid Glucose does not exceed 21 per cent.

Residue on ignition—Liquid glucose yields not more than 0.5 per cent of residue on ignition, page 685.

Sulfite—Dissolve 5 Gm. of Liquid Glucose in 50 cc. of water, and add 0.2 cc. of tenth-normal iodine, followed by a few drops of starch T.S.: a blue color is produced.

Arsenic—Dissolve 1.5 Gm. of Liquid Glucose in 5 cc. of water, add 5 cc. of sulfuric acid T.S. and 1 cc. of bromine T.S., and heat for 5 minutes on a water bath. Then add 500 mg. of potassium iodide and 5 drops of stannous chloride T.S., cool, and test the solution for *Arsenic*, page 618. The stain, if any, is not more intense than that produced in a test made with like quantities of the reagents and 2 cc. of the standard arsenic test solution (1.3 parts per million).

Heavy metals—Mix thoroughly 2 Gm. of Liquid Glucose and 2 cc. of diluted acetic acid with sufficient water to make 25 cc.: the heavy metals limit, page 657, for Liquid Glucose is 10 parts per million.
Starch—Dissolve 5 Gm. of Liquid Glucose in 50 cc. of water, boil the solution for 1 minute, and cool: the addition of 0.2 cc. of tenth-normal iodine produces no blue color.
Packaging and storage—Preserve Liquid Glucose in tight containers.

Glycerin

GLYCERIN

Glycerinum

Glycerin.—Glycerol

$C_3H_8O_3$ $CH_2OH.CHOH.CH_2OH$ Mol. wt. 92.09

Glycerin is a trihydric alcohol which contains not less than 95 per cent of $C_3H_8O_3$.

Description—Glycerin is a clear, colorless, syrupy liquid, having a sweet taste. It has not more than a slight characteristic odor, which is neither harsh nor disagreeable. When exposed to moist air, it absorbs water. Its solutions are neutral to litmus paper.
Solubility—Glycerin is miscible with water and with alcohol. It is insoluble in chloroform, in ether, and in fixed and volatile oils.
Color—The color of Glycerin, when viewed downward against a white surface in a 50-cc. Nessler tube, is not darker than the color of a standard made by diluting 0.40 cc. of ferric chloride C.S. with water to 50 cc. in a Nessler tube of approximately the same diameter and color as that containing the Glycerin.
Specific gravity—The specific gravity of Glycerin is not less than 1.249, indicating not less than 95 per cent of $C_3H_8O_3$.
Identification—Heat in a test tube a few drops of Glycerin with about 500 mg. of potassium bisulfate: pungent vapors of acrolein are evolved.
Residue on ignition—Heat 50 Gm. of Glycerin in an open, shallow, 100-cc. porcelain dish until it ignites, and allow it to burn without further application of heat in a place free from drafts. Cool, moisten the residue with 0.5 cc. of sulfuric acid, and ignite to constant weight: the weight of the residue does not exceed 5 mg.
Chloride—To 10 cc. of a solution of Glycerin (1 in 10) add 5 drops of diluted nitric acid and 0.5 cc. of silver nitrate T.S.: no turbidity is produced.
Sulfate—To 10 cc. of a solution of Glycerin (1 in 10) add 3 drops of diluted hydrochloric acid and 5 drops of barium chloride T.S.: no turbidity is produced.
Arsenic—A 10-cc. portion of a solution of Glycerin (1 Gm. in 10 cc.) meets the requirements of the test for *Arsenic*, page 618 (2 parts per million).
Heavy metals—Mix 4 cc. (5 Gm.) of Glycerin with 2 cc. of tenth-normal hydrochloric acid and dilute to 25 cc. with water: the heavy metals limit, page 657, for Glycerin is 5 parts per million.
Readily carbonizable substances—Shake 5 cc. of Glycerin vigorously with 5 cc. of sulfuric acid in a glass-stoppered, 25-cc. cylinder for 1 minute, and allow the liquid to stand for 1 hour: the mixture does not become darker than matching fluid H, page 680.
Acrolein, glucose, and ammonium compounds—A mixture of 5 cc. of Glycerin and 5 cc. of a solution of potassium hydroxide (1 in 10) does not become yellow when kept for 5 minutes at 60°, nor does it emit an odor of ammonia.

Fatty acids and esters—Mix 40 cc. (50 Gm.) of Glycerin with 50 cc. of freshly boiled water and 5 cc. of half-normal sodium hydroxide, boil the mixture for 5 minutes, then cool it, and titrate the excess of alkali with half-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Perform a blank determination with the same reagents and in the same manner, and make any necessary correction: not less than 4 cc. of half-normal hydrochloric acid is required.

Packaging and storage—Preserve Glycerin in tight containers.

Glycerin Suppositories

GLYCERIN SUPPOSITORIES

Suppositoria Glycerini

Supp. Glycerin.

GLYCERIN	92 Gm.
SODIUM STEARATE	8 Gm.
DISTILLED WATER	5 Gm.
To make about	100 Gm.

Heat the glycerin in a porcelain dish, on a water bath, to about 95°, add the sodium stearate, and stir the mixture gently with a glass rod, maintaining the specified temperature until the sodium stearate is dissolved. Then add the distilled water, mix thoroughly, and immediately pour the hot liquid into suitable moulds. Remove the suppositories when they are cold.

NOTE—If preferred, the sodium stearate for Glycerin Suppositories may be prepared during the making of the Suppositories by the direct reaction between stearic acid and sodium bicarbonate, sodium carbonate, or sodium hydroxide, these being taken in correct proportion.

Packaging and storage—Preserve Glycerin Suppositories in tight containers, preferably at a temperature not above 25°.

GLYCERYL TRIACETATE

Glycerylis Triacetas

Glyceryl. Triacet.—Triacetin

$$
\begin{array}{l}
\mathrm{H} \\
\mathrm{HCO.OCCH_3} \\
\quad | \\
\mathrm{HCO.OCCH_3} \\
\quad | \\
\mathrm{HCO.OCCH_3} \\
\mathrm{H}
\end{array}
$$

$C_9H_{14}O_6$ Mol. wt. 218.20

Glyceryl Triacetate contains not less than 98.5 per cent of $C_9H_{14}O_6$.

Description—Glyceryl Triacetate is a colorless, somewhat oily liquid with a slight, fatty odor, and a bitter taste.

Solubility—Glyceryl Triacetate is soluble in water. It is miscible with alcohol, with ether and with chloroform, and is insoluble in carbon disulfide.

Specific gravity—The specific gravity of Glyceryl Triacetate is not less than 1.154 and not more than 1.158.

Distillation range—Not less than 95 per cent of Glyceryl Triacetate distils between 257° and 260°, page 612.

Refractive index—The refractive index of Glyceryl Triacetate is not less than 1.4288 and not more than 1.4296 at 25°, page 682.

Identification—

A: Heat a few drops of Glyceryl Triacetate in a test tube with about 500 mg. of potassium bisulfate: pungent vapors of acrolein are evolved.

B: The solution resulting from the *Assay* responds to the test for *Acetate*, page 658.

Moisture—Determine the moisture present in 150 cc. of Glyceryl Triacetate by the *Toluene Method*, page 712: not more than 0.3 cc. of water is present.

Free acid—Dilute 25 Gm. of Glyceryl Triacetate, accurately weighed, with 50 cc. of neutralized alcohol, add 5 drops of phenolphthalein T.S., and titrate with fiftieth-normal sodium hydroxide: not more than 1 cc. of fiftieth-normal sodium hydroxide is consumed.

Unsaturated compounds—To 10 cc. of Glyceryl Triacetate in a glass-stoppered tube add, dropwise, a solution of bromine in carbon tetrachloride (1 cc. in 100 cc.) until a permanent yellow color is produced, and allow to stand in a dark place for 18 hours: no turbidity or precipitate appears.

Assay—Weigh accurately from 1 to 1.2 Gm. of Glyceryl Triacetate in a 250-cc. Erlenmeyer flask, add exactly 50 cc. of half-normal alcoholic potassium hydroxide, and close the flask with a suitable stopper having an air condenser consisting of a glass tube about 75 cm. in length and 5 to 8 mm. internal diameter. Heat the flask on a steam bath for 45 minutes, frequently rotating the contents, then cool, and titrate the excess of alkali with half-normal hydrochloric acid, using about 0.3 cc. of phenolphthalein T.S. as the indicator. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. Each cc. of half-normal alcoholic potassium hydroxide is equivalent to 36.37 mg. of $C_9H_{14}O_6$.

Packaging and storage—Preserve Glyceryl Triacetate in tight containers, and do not permit contact with metal.

Glyceryl Trinitrate Tablets

GLYCERYL TRINITRATE TABLETS

Tabellæ Glycerylis Trinitratis

Tab. Glyceryl. Trinitrat.—Nitroglycerin Tablets, Trinitrin Tablets

Glyceryl Trinitrate Tablets contain not less than 80 per cent and not more than 112 per cent of the labeled amount of glyceryl trinitrate $C_3H_5(NO_3)_3$.

Assay—Weigh accurately a counted number of Glyceryl Trinitrate Tablets, sufficient to represent about 50 mg. of glyceryl trinitrate, and carefully reduce them to a fine powder without appreciable loss. Transfer the powder to a 400-cc. beaker, add sufficient ether to cover it, stir well during 5 minutes, then allow to settle. Decant the clear ether through a dry filter paper into an 800-cc. Kjeldahl flask. Repeat the extraction three times with 50-cc., or larger, portions of ether in the same manner as before. Transfer the undissolved residue to a separator with the aid of about 50 cc. of water, and agitate until no more seems to dissolve. Shake the solution with four 25-cc. portions of ether, filtering the ether through the same filter paper as before into the Kjeldahl flask. Wash the filter and funnel with some additional ether, receiving the washings in the Kjeldahl flask. (The extraction may also be effected by the use of a Soxhlet or similar extractor.) Evaporate the ether by means of a current of warm air to about 20 cc., add 100 cc. of water, and remove most of the remaining ether with a current of air. Add a mixture of 30 cc. of normal sodium hydroxide, 60 cc. of water, and 10 cc. of a 5 per cent solution of potassium permanganate, and follow with 100 cc. of water. Mix well, allow to stand for 30 minutes, then heat on a water bath for 30 minutes. Cool well, add 3 Gm. of powdered Devarda's alloy, immediately stopper the flask with a stopper carrying a scrubber, and connected with a vertical condenser by means of a Kjeldahl connecting bulb and with a suitable receiver containing 50 cc. of fiftieth-normal sulfuric acid. Heat the flask with a low flame as long as hydrogen is evolved, then raise the flame, and heat until about two-thirds of the contents of the flask has distilled. Titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Perform a blank determination with the same quantities of the same reagents and in the same manner and make any necessary correction. Each cc. of fiftieth-normal sulfuric acid is equivalent to 1.514 mg. of $C_3H_5(NO_3)_3$.

Packaging and storage—Preserve Glyceryl Trinitrate Tablets in well-closed containers.

Sizes—Glyceryl Trinitrate Tablets usually available contain the following amounts of glyceryl trinitrate: 0.3, 0.4, 0.6, and 1.2 mg. ($\frac{1}{200}$, $\frac{1}{150}$, $\frac{1}{100}$, and $\frac{1}{50}$ grain).

AVERAGE DOSE OF GLYCERYL TRINITRATE—**0.4 mg.**—(approximately $\frac{1}{150}$ grain).

Glycyrrhiza

GLYCYRRHIZA

Glycyrrhiza

Glycyrrh.—Licorice Root

Glycyrrhiza is the dried rhizome and roots of *Glycyrrhiza glabra* Linné var. *typica* Regel et Herder, known in commerce as Spanish Licorice, or

of *Glycyrrhiza glabra* Linné var. *glandulifera* Waldstein et Kitaibel, known in commerce as Russian Licorice, or of other varieties of *Glycyrrhiza glabra* Linné, yielding a yellow and sweet wood (Fam. *Leguminosæ*).

Description—

Unground Spanish Glycyrrhiza— Nearly cylindrical, the upper portion more or less knotty; usually in pieces from 14 to 20 cm. or more in length and from 5 to 20 mm. in thickness; externally yellowish brown or dark brown, longitudinally wrinkled, the thinner rhizomes often having prominent alternate buds, the thicker rhizomes having distinct corky patches; fracture coarsely fibrous; internally yellow, radiate; odor distinctive; taste sweetish and slightly acrid.

Unground Russian Glycyrrhiza—Nearly cylindrical, somewhat tapering, sometimes split longitudinally, from 15 to 30 cm. in length and from 1 to 5 cm. in diameter; when deprived of the outer corky layer, it is externally pale yellow; fracture coarsely fibrous; internally pale yellow; wood radially cleft; odor distinctive, taste sweetish.

Histology—Rhizome with numerous layers of yellowish brown cork cells, absent in the peeled drug; one or more rows of cells with a tendency of collenchymatous thickening; a middle bark of starch-bearing parenchyma and groups of fibers more or less surrounded with crystal-fibers; inner bark with radial arrangements of phloem and medullary rays, the phloem consisting of wedges of small groups of bast-fibers more or less surrounded with crystal-fibers and parenchyma separated tangentially by sieve tissue, the cells of the latter with thick, highly refracting walls; medullary rays from 1 to 8 cells wide; wood-wedges broad, consisting of large tracheæ with yellowish walls, small compact groups of wood-fibers more or less surrounded with crystal fibers, tracheids, and starch-bearing parenchyma; pith of large, more or less polygonal, starch-bearing parenchyma or occasionally containing prisms of calcium oxalate. In roots the pith is absent.

Powdered Glycyrrhiza—Brownish yellow (unpeeled Licorice) or pale yellow (peeled Licorice); starch grains numerous, mostly simple and elliptical, oval or spheroidal, from 2 to 20 microns in diameter; tracheæ mostly with bordered pores up to 200 microns in diameter; wood- and bast-fibers numerous, very long, much attenuated at the ends and about 10 microns in width; crystal-fibers with monoclinic prisms of calcium oxalate, the latter from 10 to 30 microns in length; fragments of reddish brown cork cells which are practically absent in the powder prepared from peeled Licorice.

Acid-insoluble ash—Glycyrrhiza yields not more than 2.5 per cent of *Acid-insoluble ash*, pages 710 and 711.

Glycyrrhiza Extract

GLYCYRRHIZA EXTRACT

Extractum Glycyrrhizæ

Ext. Glycyrrh.—Licorice Root Extract, Licorice

An extract prepared from the rhizome and roots of species of *Glycyrrhiza* Tournefort ex Linné (Fam. *Leguminosæ*).

Description—Glycyrrhiza Extract occurs as a brown powder, in flattened, cylindrical rolls, or in masses. The rolls or masses have a glossy black color externally, and a brittle, sharp, smooth, conchoidal fracture. The Extract has a characteristic and sweet taste which is not more than very slightly acrid.

Insoluble matter—Not more than 25 per cent of Glycyrrhiza Extract is insoluble in cold water.

Foreign starch—Prepare a 5 per cent mixture of Glycyrrhiza Extract, using cold water. The sediment from this mixture, mounted and examined under a microscope, shows no foreign starch.
Ash—Glycyrrhiza Extract, when rendered anhydrous, yields not more than 8 per cent of ash, *Method IV*, pages 710 and 711.
Packaging and storage—Preserve Glycyrrhiza Extract in well-closed containers.

Glycyrrhiza Extract, Pure

PURE GLYCYRRHIZA EXTRACT

Extractum Glycyrrhizæ Purum

Ext. Glycyrrh. Pur.—Pure Licorice Root Extract

Moisten 1000 Gm. of glycyrrhiza, in granular powder, with boiling water, transfer it to a percolator, and percolate with boiling water until the glycyrrhiza is exhausted. Add enough ammonia solution to the percolate to impart a distinctly ammoniacal odor, then boil the liquid under atmospheric pressure until it is reduced to a volume of about 1500 cc. Filter the liquid, and immediately evaporate the filtrate until the residue has a pilular consistence.

Description—Pure Glycyrrhiza Extract is a black, pilular mass having a characteristic, sweet taste.
Packaging and storage—Preserve Pure Glycyrrhiza Extract in well-closed containers

Glycyrrhiza Fluidextract

GLYCYRRHIZA FLUIDEXTRACT

Fluidextractum Glycyrrhizæ

Fldext. Glycyrrh.—Licorice Root Fluidextract

GLYCYRRHIZA, in very coarse powder................ 1000 Gm.

Prepare a fluidextract by Process D, page 654, percolating at a moderate rate. Add enough diluted ammonia solution to the percolate to impart a distinctly ammoniacal odor, then boil the liquid actively under normal atmospheric pressure until it is reduced to a volume of about 1500 cc. Filter the liquid, evaporate the filtrate on a water bath until the residue measures 750 cc., cool, and gradually add 250 cc. of alcohol and enough water to make the product measure 1000 cc. Mix thoroughly.

Packaging and storage—Preserve Glycyrrhiza Fluidextract in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 20 to 24 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—2 cc. (approximately 30 minims).

GLYCYRRHIZA SYRUP

Syrupus Glycyrrhizæ

Syr. Glycyrrh.—Licorice Syrup

Glycyrrhiza Fluidextract	250	cc.
Fennel Oil	0.05	cc.
Anise Oil	0.5	cc.
Syrup, a sufficient quantity,		
To make	1000	cc.

Add the oils to the fluidextract and agitate until thoroughly mixed. Then add sufficient syrup to make the product measure 1000 cc. and mix well.

Alcohol content—From 5 to 6 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Glycyrrhiza Syrup in tight containers, preferably at a temperature not above 25°.

Granulated Opium . PAGE 360

SURGICAL GUT

Chorda Chirurgicalis

Surgical "Catgut," "Catgut" Suture

Surgical Gut consists of gut prepared from the longitudinally split segment of submucous connective tissue of the small intestine of healthy sheep, *Ovis aries* Linné (Fam. *Bovidæ*), and rendered sterile and protected from contamination.

Description—Surgical Gut is either plain gut which has not been treated in any manner which will alter its normal rate of digestibility, known as *Type A*, *Plain or Untreated*, or it is gut which has been tanned or otherwise treated so that it will resist digestion for longer but varying periods of time, and known respectively as *Type B, Mild Treatment; Type C, Medium Treatment;* and *Type D, Prolonged Treatment.* One form of treatment is frequently referred to as *Chromic.* The types mentioned are supplied as *Boilable* or as *Non-boilable* Surgical Gut. Surgical Gut is uniformly and firmly twisted.

Caution—The tubes of Surgical Gut marked "Non-boilable" must not be subjected to heat. Tubes marked "Boilable" may be heated for purposes of sterilizing the outside of the tube.

Length—Determine the length of Surgical Gut immediately after removal from the tube and without stretching: the length of each strand is not less than 90 per cent of the length stated on the label.

Diameter—Determine the diameter of Surgical Gut immediately after removal from the tube and without stretching as directed under *Diameter of Sutures*, page 639. Determine the diameter of the Gut at three quarterly points of the strands in 12 tubes, which may represent either a single commercial package or which may be drawn at random from a lot. At least 2 of the measurements on each of not less than 10 of the strands shall conform to the required diameter for the size indicated on the label, and at least one measurement of each of the remaining strands shall conform to the requirement. In no case shall any measurement vary more than the required diameter of the size next above or below.

Diameter of Surgical Gut

Size	Boilable				Non-boilable			
	Millimeter		Inch		Millimeter		Inch	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
0000000, 7-0	0.025	0.051	0.001	0.002	0.025	0.064	0.0010	0.0025
000000, 6-0	0.051	0.102	0.002	0.004	0.064	0.113	0.0025	0.0045
00000, 5-0	0.102	0.152	0.004	0.006	0.113	0.179	0.0045	0.0070
0000, 4-0	0.152	0.203	0.006	0.008	0.179	0.241	0.0070	0.0095
000, 3-0	0.203	0.254	0.008	0.010	0.241	0.318	0.0095	0.0125
00, 2-0	0.254	0.330	0.010	0.013	0.318	0.406	0.0125	0.0160
0, 1-0	0.330	0.406	0.013	0.016	0.406	0.495	0.0160	0.0195
1	0.406	0.483	0.016	0.019	0.495	0.584	0.0195	0.0230
2	0.483	0.559	0.019	0.022	0.584	0.673	0.0230	0.0265
3	0.559	0.635	0.022	0.025	0.673	0.762	0.0265	0.0300
4	0.635	0.711	0.025	0.028	0.762	0.864	0.0300	0.0340
5	0.711	0.813	0.028	0.032	0.864	0.978	0.0340	0.0385
6	0.813	0.914	0.032	0.036	0.978	1.105	0.0385	0.0435
7	0.914	1.016	0.036	0.040	1.105	1.219	0.0435	0.0480

Tensile strength—Determine the tensile strength of Surgical Gut, immediately after removal from the tube and without drying, both on a straight pull and over a surgeon's knot, as directed under *Tensile Strength Determination*, page 699. Divide each strand into two parts, and use one part for the straight pull and the other for the surgeon's knot, thus obtaining two breaks on each strand. The minimum tensile strength of each size, calculated on the average strength of 10 strands from any lot, is as follows:

Tensile Strength of Surgical Gut

Size	Minimum Tensile Strength of Surgical Gut in Avoirdupois Pounds	
	On Straight Pull	Over a Surgeon's Knot
0000000, 7-0	0.25	0.125
000000, 6-0	0.5	0.25
00000, 5-0	1.0	0.5
0000, 4-0	2.0	1.0
000, 3-0	3.0	2.0
00, 2-0	5.0	3.0
0, 1-0	7.0	5.0
1	10.0	7.0
2	13.0	9.0
3	16.0	11.0
4	20.0	13.0
5	25.0	17.0
6	30.0	21.0
7	35.0	25.0

Soluble chromium compounds—Place 5 Gm. of Surgical Gut, as far as possible in whole strands, in 250 cc. of water and set aside for 3 hours, agitating occasionally. Filter into an evaporating dish, evaporate the filtrate to dryness on a water bath, add 250 mg. of a mixture of equal parts of potassium carbonate and potassium nitrate to the dried residue, and fuse the mixture. Cool, and dissolve the cooled mass in 25 cc. of water: the solution shows no yellow tinge or color when observed against a white background in a color-comparison tube 25 mm. in diameter.

Sterility—Surgical Gut meets the requirements of the *Sterility Tests for Solids*, page 689.

Labeling—The label on each tube and each package of Surgical Gut shall indicate the size and type of Gut, whether "non-boilable" or "boilable," and also the name of the manufacturer. The label on the package shall also indicate the address of the manufacturer, the lot number identifying the method and time of sterilization of the Gut, and the composition of any tubing fluid used.

Packaging and storage—Preserve each strand of Surgical Gut in an individual, hermetically sealed glass tube.

Halibut Liver Oil

HALIBUT LIVER OIL

Oleum Hippoglossi

Ol. Hippoglos.

Halibut Liver Oil is the fixed oil obtained from the fresh, or suitably preserved livers of *Hippoglossus hippoglossus* Linné (Fam. *Pleuronectidæ*). Halibut Liver Oil contains in each Gm. not less than 60,000 U. S. P. Units of Vitamin A and not less than 600 U. S. P. Units of Vitamin D.

Halibut Liver Oil may be flavored by the addition of not more than 1 per cent of any one or any mixture of flavoring substances recognized in this Pharmacopœia.

Description—Halibut Liver Oil is a yellow to brownish yellow, oily liquid, and has a characteristic, slightly fishy, but not a rancid, odor, and a fishy taste.

Solubility—Halibut Liver Oil is insoluble in water. It is slightly soluble in alcohol, but is freely soluble in ether, in chloroform, in carbon disulfide, and in ethyl acetate.

Specific gravity—The specific gravity of Halibut Liver Oil is between 0.920 and 0.930.

Identification—A solution of 1 drop of Halibut Liver Oil in 1 cc. of chloroform, when shaken with 1 drop of sulfuric acid, acquires a blue color, changing to violet, then to dark green and finally to brown.

Free fatty acids—Dissolve 2 Gm. of Halibut Liver Oil in 20 cc. of a mixture of equal volumes of alcohol and ether, which has been previously neutralized with tenth-normal sodium hydroxide, add 5 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking for 15 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Unsaponifiable matter—Halibut Liver Oil contains not less than 7 per cent and not more than 22.5 per cent of unsaponifiable matter, page 648.

Iodine value—The iodine value of Halibut Liver Oil, using from 180 to 200 mg. of Oil, accurately weighed, is not less than 125 and not more than 155, page 647.
Saponification value—The saponification value of Halibut Liver Oil is not less than 160 and not more than 180, page 647.
Assay—Proceed as directed under *Vitamins A and D Assays*, page 718.
Packaging and storage—Preserve Halibut Liver Oil in tight containers. Halibut Liver Oil may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.
Labeling—The Vitamin A potency and Vitamin D potency of Halibut Liver Oil, when designated on the label, shall be expressed in "United States Pharmacopœia Units" per gram of oil; these units may be referred to as "U. S. P. Units."

AVERAGE DAILY DOSE—Prophylactic, infants and adults, **0.1 cc.** (approximately $1\frac{1}{2}$ minims).

NOTE—Halibut Liver Oil containing more than the minimum U. S. P. requirement for vitamin A may be administered in proportionally smaller doses.

Halibut Liver Oil Capsules

HALIBUT LIVER OIL CAPSULES

Capsulæ Olei Hippoglossi

Cap. Ol. Hippoglos.

Halibut Liver Oil Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of halibut liver oil, and the oil from the Capsules contains, in each Gm., not less than 60,000 U. S. P. Units of Vitamin A. Halibut Liver Oil Capsules shall be labeled to contain either 5000 or 25,000 U. S. P. Units of Vitamin A per Capsule.

Oil content of capsules—Weigh accurately 20 Halibut Liver Oil Capsules in a tared weighing bottle. Carefully open the capsules without any loss of the shell material, and transfer the contents to a suitable container. Remove any oil remaining in the emptied capsules by washing with small portions of ether, and allow the capsules to dry at room temperature until the odor of ether is no longer perceptible. Weigh the emptied capsules in the same tared bottle in which the full capsules were weighed. The difference represents the weight of halibut liver oil in the 20 Capsules.

When the oil in the Capsules is dispersed throughout a solid or semi-solid gelatin medium, proceed as follows:

Weigh accurately 10 Capsules and transfer to a 25-cc. glass-stoppered graduated cylinder. Add 20 cc. of 1 per cent solution of pepsin, adjusted to a pH of 2.4, using a glass electrode, with tenth-normal hydrochloric acid, and digest at 37.5° for 16 to 18 hours or until digestion is complete. Heat in an oven at 80° for 30 minutes. Cool, and transfer to a 125-cc. glass-stoppered separator, designed to be used as a centrifuge tube. Rinse the graduated cylinder with 30 cc. of methylene chloride, pour into the separator, shake vigorously, centrifuge, and draw off the underlying methylene chloride into a 125-cc. tared Erlenmeyer flask placed on a steam bath while the subsequent extractions are being carried out. Extract

similarly with four additional 25-cc. portions of methylene chloride, flushing the graduated cylinder with each portion before it is added to the separator, and draw off the underlying methylene chloride into the tared Erlenmeyer flask. Test the fifth extraction for the absence of residue by the evaporation of a drop on polished glass to indicate the completeness of extraction. If necessary to complete the extraction, use additional 25-cc. portions of solvent. Complete the evaporation of the solvent from the mixed extractions on a steam bath and remove the last traces of solvent under reduced pressure. The weight of the oil so extracted represents the weight of oil in 10 Capsules.

Description, tests, and assay—The oil obtained from Halibut Liver Oil Capsules conforms in all respects to the specifications under *Halibut Liver Oil*, page 247.

Packaging and storage—Preserve Halibut Liver Oil Capsules in well-closed containers and protect the oil in the Capsules from light.

AVERAGE DAILY PROPHYLACTIC DOSE—One Capsule containing 5000 U. S. P. Vitamin A Units.

NOTE—The dose of the 25,000 Vitamin A-Unit Capsules is to be determined by the physician in accordance with the needs of the patient.

Helium

HELIUM

Helium

He At. wt. 4.003

Helium contains not less than 95 per cent by volume of He, the remainder consisting mainly of nitrogen.

Description—Helium is a colorless, odorless, tasteless gas which is neither combustible nor supports combustion. A liter of Helium at a pressure of 760 mm. and at 0° weighs not less than 174.5 mg. and not more than 232.5 mg., indicating not less than 95 per cent of He.

Solubility—Helium is very slightly soluble in water.

Identification—A burning splinter of wood is extinguished in an atmosphere of Helium. Mixtures of Helium and hydrogen are neither inflammable nor explosive when oxygen is excluded.

Note: Cylinders containing Helium must be kept at a temperature of 25° ± 2°, for at least 6 hours before the Helium is withdrawn for the following determinations. Samples for the following tests are to be corrected to a pressure of 760 mm. and a temperature of 25°.

Acids or alkalies—Helium meets the requirements of the test for *Acids or alkalies* under *Oxygen*, page 373.

Oxidizing substances—Helium meets the requirements of the test for *Other oxidizing substances* under *Oxygen*, page 373.

Carbon monoxide—Helium meets the requirements of the test for *Carbon monoxide* under *Ethylene*, page 213.

Packaging and storage—Preserve Helium in tight containers.

Hexavitamin Capsules

HEXAVITAMIN CAPSULES

Capsulæ Hexavitaminarum

Cap. Hexavitam.

Hexavitamin Capsules contain in each Capsule not less than 5000 U. S. P. Units of Vitamin A from natural (animal) sources, 400 U. S. P. Units of Vitamin D from natural (animal) sources or as activated ergosterol or activated 7-dehydrocholesterol, 75 mg. of ascorbic acid, 2 mg. of thiamine hydrochloride, 3 mg. of riboflavin, and 20 mg. of nicotinamide.

Assay for vitamins A and D—Determine the weight of a counted number of not less than 10 Hexavitamin Capsules, cut the Capsules with a sharp instrument and express the contents as completely as possible into a tared container, and weigh. Remove any material remaining in the cut capsules by washing with several small portions of ether, allow the capsules to dry at room temperature until the odor of ether is no longer perceptible, and weigh. The difference in weight between the counted number of Capsules and the ether-extracted cut capsules represents the contents of the Capsules.

With the aid of approximately 25 cc. of an edible vegetable oil that is known to be free from vitamins A and D, transfer the expressed contents of the Capsules to a 50-cc. volumetric, glass-stoppered container, and add sufficient of the vegetable oil to make 50 cc. Displace the air with an inert gas and shake the mixture thoroughly. Dilute an aliquot of the mixture to such a volume that 0.1 cc. contains the daily dose of the vitamin to be administered. Proceed as directed under *Vitamins A and D Assays*, page 718. Calculate the vitamin A and D values per Capsule.

When the oil in the Hexavitamin Capsules is dispersed throughout a solid or semisolid gelatin medium, proceed as follows:

Place a counted number of not less than 10 Capsules in a 25-cc. glass-stoppered graduated cylinder. Add 20 cc. of 1 per cent solution of pepsin, adjusted to a pH of 2.4, using a glass electrode, with tenth-normal hydrochloric acid, and digest at 37.5° for 16 to 18 hours or until digestion is complete. Heat in an oven at 80° for 30 minutes. Cool, and transfer to a 125-cc. glass-stoppered separator, designed to be used as a centrifuge tube. Rinse the graduated cylinder with 30 cc. of methylene chloride, pour into the separator, shake vigorously, centrifuge, and draw off the underlying methylene chloride into a 125-cc. tared Erlenmeyer flask, placed on a steam bath while the subsequent extractions are being carried out. Extract similarly with four additional 25-cc. portions of methylene chloride, flushing the graduated cylinder with each portion before it is added to the separator, and drawing off the underlying methylene chloride into the tared Erlenmeyer flask. Test the fifth extraction for the absence of residue by the evaporation of a drop on polished glass to indicate the completeness of extraction. If necessary to complete the extraction, use additional 25-cc. portions of solvent. Complete the evaporation of the solvent from the mixed extractions on a steam bath and remove the last traces of solvent under reduced pressure. Finally, dilute the extracted oil with an edible fixed oil, known to be free from vitamins A and D, to such volume that not more than 0.1 cc. contains the daily dose of the vitamin to be administered. Proceed as directed under *Vitamins A and D Assays*, page 718.

Assay for ascorbic acid—Add a counted number of not less than 10 Hexavitamin Capsules to 75 cc. of extracting solution (see *Ascorbic Acid Assay*, page 620); heat rapidly to not over 90°, with continuous swirling until complete disintegration occurs. Transfer the suspension to a 500-cc. glass-stoppered volumetric flask containing 125 cc. of unheated extracting solution, and immediately cool rapidly to

room temperature. Transfer any remaining residue by rinsing four or five times with 10-cc. portions of the extracting solution, and add water to make 500 cc. By means of a dry glass rod any solid fatty material above the calibration line may be made to adhere to the glass wall of the flask and need not affect the volume of the water solution. After thorough mixing, the fatty solids may be removed. Using a 1-cc. aliquot, proceed as directed under *Ascorbic Acid Assay*, page 620.

Assay for thiamine hydrochloride—Disperse a counted number of not less than 10 Hexavitamin Capsules in tenth-normal sulfuric acid. Shake to effect complete solution of the thiamine hydrochloride and make up the volume so that the resulting solution will contain approximately 50 micrograms of thiamine hydrochloride for each cc. Pipette 2 cc. of the resulting solution into 65 cc. of tenth-normal sulfuric acid, contained in a 100-cc. centrifuge tube, and proceed as directed under *Thiamine Assay, Thiochrome Method*, page 705, starting with the words "digest it on a steam bath with frequent mixing for 30 minutes."

Assay for riboflavin—Place a counted number of not less than 10 Hexavitamin Capsules in a 1000-cc. flask, and add 400 cc. of tenth-normal hydrochloric acid. If more than 10 Capsules are used, add such a volume of tenth-normal hydrochloric acid that the resulting solution will contain not more than 100 micrograms of riboflavin per cc. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, shake vigorously, cool, add sufficient sodium hydroxide T.S. to produce a pH of 6.8, then sufficient water to make 1000 cc., and filter through filter paper known not to adsorb riboflavin. To an aliquot of suitable size, add water to make a volume such that 100 cc. will contain approximately 10 micrograms of riboflavin. Using this as the *Test Solution of the Material to be Assayed*, proceed as directed under *Riboflavin Assay*, page 685, beginning with the paragraph headed *Standard Riboflavin Solution*.

Assay for nicotinamide—Place a counted number of not less than 10 Hexavitamin Capsules in a 300-cc. flask containing 100 cc. of normal sulfuric acid. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, shake vigorously, cool, add sodium hydroxide T.S. to produce a pH of 6.8, and sufficient water to make 1000 cc. To an aliquot of suitable size, add water to make a volume such that 100 cc. will contain approximately 10 micrograms of nicotinamide. Using this as the *Test Solution of the Material to be Assayed*, proceed as directed under *Nicotinic Acid or Nicotinamide Assay*, page 669, beginning with the paragraph headed *Standard Nicotinic Acid Solution*.

Packaging and storage—Preserve Hexavitamin Capsules in tight, light-resistant containers.

Labeling—The labeling shall include no claim based upon any quantity of vitamin in excess of that specified in this monograph.

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

Hexavitamin Tablets

HEXAVITAMIN TABLETS

Tabellæ Hexavitaminarum

Tab. Hexavitam.

Hexavitamin Tablets contain in each Tablet not less than 5000 U. S. P. Units of Vitamin A from natural (animal) sources, 400 U. S. P. Units of Vitamin D from natural (animal) sources, or as activated ergosterol or activated 7-dehydrocholesterol, 75 mg. of ascorbic acid, 2 mg. of thiamine hydrochloride, 3 mg. of riboflavin, and 20 mg. of nicotinamide.

Assay for vitamin A—Grind a counted number of not less than 3 Hexavitamin Tablets in a mortar under a small volume (approximately 4 cc. or sufficient to cover the Tablets) of an edible vegetable oil that is known to be free from vitamin A, in such manner as to allow a minimum of exposure of the Tablets to air during the grinding. Dilute the resulting mixture with the oil to 25 cc., replace the air in the container with an inert gas, shake the mixture thoroughly, and allow it to stand over night in the dark, at a temperature not exceeding 10°. Again shake the mixture thoroughly and dilute an aliquot of suitable size to such a volume that 0.1 cc. of the dilution contains the daily dose of vitamin A to be administered. Proceed as directed under *Vitamins A and D Assays*, page 718.

Assay for vitamin D—Grind a counted number of not less than 10 Hexavitamin Tablets in a mortar under a small volume (approximately 4 cc.) of an edible vegetable oil that is known to be free from vitamin D. Dilute the resulting mixture with the oil to 50 cc., shake the mixture thoroughly, and allow it to stand over night at a temperature not exceeding 10°. Again shake the mixture thoroughly and dilute an aliquot of suitable size to such a volume that 0.1 cc. of the dilution contains the daily dose of vitamin D to be administered. Proceed as directed under *Vitamins A and D Assays*, page 718.

Assay for ascorbic acid—Grind a counted number of not less than 10 Hexavitamin Tablets in a mortar, in sufficient extracting solution (see *Ascorbic Acid Assay*, page 620) to make a paste. Transfer the paste to a 500-cc. volumetric flask with the aid of 225 cc. of extracting solution, and add water to make 500 cc. Using a 1-cc. aliquot, proceed as directed under *Ascorbic Acid Assay*, page 620.

Assay for thiamine hydrochloride—Disperse a counted number of not less than 10 Hexavitamin Tablets, in 100 cc. of tenth-normal sulfuric acid, and with an aliquot of suitable size proceed as directed under *Thiamine Assay, Thiochrome Method*, page 705.

NOTE—Tablet coatings may contain certain substances which interfere in the thiochrome determination causing low values. In these cases the coating must be carefully removed before assaying the tablets for thiamine hydrochloride.

Assay for riboflavin—Place a counted number of not less than 10 Hexavitamin Tablets in a 1000-cc. flask and add 400 cc. of tenth-normal hydrochloric acid. If more than 10 Tablets are used, add such a volume of tenth-normal hydrochloric acid that the resulting solution will contain not more than 100 micrograms of riboflavin per cc. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, shake vigorously, cool, add sufficient sodium hydroxide T.S. to produce a pH of 6.8, then sufficient water to make 1000 cc., and filter through filter paper known not to adsorb riboflavin. To an aliquot of suitable size, add water to make a volume such that 100 cc. contains approximately 10 micrograms of riboflavin. Using this as the *Test Solution of the Material to be Assayed*, proceed as directed under *Riboflavin Assay*, page 685, beginning with the paragraph headed *Standard Riboflavin Solution*.

Assay for nicotinamide—Place a counted number of not less than 10 Hexavitamin Tablets in a 300-cc. flask containing 100 cc. of normal sulfuric acid. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, shake vigorously, cool, add sodium hydroxide T.S. to produce a pH of 6.8, and then sufficient water to make 1000 cc. To an aliquot of suitable size, add water to make a volume such that 100 cc. contains approximately 10 micrograms of nicotinamide. Using this as the *Test Solution of the Material to be Assayed*, proceed as directed under *Nicotinic Acid or Nicotinamide Assay*, page 669, beginning with the paragraph headed *Standard Nicotinic Acid Solution*.

Packaging and storage—Preserve Hexavitamin Tablets in tight containers.

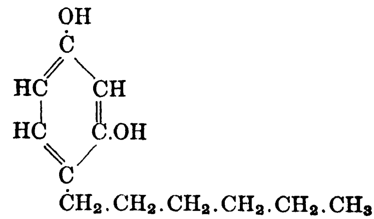
Labeling—The labeling shall include no claim based upon any quantity of vitamin in excess of that specified in this monograph.

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

HEXYLRESORCINOL

Hexylresorcinol

Hexylresorcin.



$C_{12}H_{18}O_2$ Mol. wt. 194.26

Hexylresorcinol, when dried to constant weight over sulfuric acid, contains not less than 98 per cent of $C_{12}H_{18}O_2$.

Caution—Hexylresorcinol is irritating to the respiratory tract and to the skin, and an alcoholic solution has vesicant properties.

Description—Hexylresorcinol occurs as white, or yellowish white, needle-shaped crystals. It has a faint, fatty odor and a sharp, astringent taste, and produces a sensation of numbness when placed on the tongue. It acquires a brownish pink tint on exposure to light and air.

Solubility—One Gm. of Hexylresorcinol dissolves in about 2000 cc. of water. It is freely soluble in alcohol, in methanol, in glycerin, in ether, in chloroform, in benzene, and in vegetable oils.

Melting range—Hexylresorcinol melts between 62° and 67°, page 667.

Identification—

A: Add 1 cc. of nitric acid to 1 cc. of a saturated solution of Hexylresorcinol: a light red color appears.

B: Add 1 cc. of bromine T.S. to 1 cc. of a saturated solution of Hexylresorcinol: a yellow, flocculent precipitate forms. Upon the addition of 2 cc. of ammonia T.S., the precipitate dissolves, producing a solution with a yellow color.

Acid—Dissolve 250 mg. of Hexylresorcinol in 500 cc. of water, and titrate the solution with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator: not more than 1 cc. of alkali is required.

Residue on ignition—Hexylresorcinol yields not more than 0.1 per cent of residue on ignition, page 685.

Resorcinol and other phenols—Shake about 1 Gm. of Hexylresorcinol with 50 cc. of water for a few minutes, filter, and add 3 drops of ferric chloride T.S. to the filtrate: no red or blue color is produced.

Assay—Dissolve from 70 to 100 mg. of Hexylresorcinol, previously dried to constant weight over sulfuric acid and accurately weighed, in 10 cc. of methanol in a 250-cc. iodine flask. Add exactly 30 cc. of tenth-normal bromine, then add quickly 5 cc. of hydrochloric acid, and stopper the flask immediately. Cool the flask under running water to room temperature, and shake it vigorously for 5 minutes, then set aside for 30 minutes, shaking occasionally. Cautiously remove the stopper, add 6 cc. of potassium iodide T.S., and swirl gently. Add 1 cc. of chloroform, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch

T.S. as the indicator. Determine the normality of the bromine solution in the same manner as in the test. Each cc. of tenth-normal bromine is equivalent to 4.857 mg. of $C_{12}H_{18}O_2$.

Packaging and storage—Preserve Hexylresorcinol in tight, light-resistant containers.

AVERAGE DOSE—Anthelmintic, 1 Gm. (approximately 15 grains).

Hexylresorcinol Pills

HEXYLRESORCINOL PILLS

Pilulæ Hexylresorcinolis

Pil. Hexylresorc.

Hexylresorcinol Pills contain crystalline hexylresorcinol and are covered with a tough gelatin coating. Hexylresorcinol Pills contain not less than 91 per cent and not more than 109 per cent of the labeled amount of $C_{12}H_{18}O_2$.

Identification—Carefully remove the gelatin coating from a sufficient number of the Pills and triturate a quantity of the contents, equivalent to about 100 mg. of hexylresorcinol, with about 10 cc. of petroleum benzin. Transfer the mixture, with the aid of 15 cc. of petroleum benzin, to a small flask, attach a reflux condenser, and reflux for 15 minutes. Filter the liquid while hot, and place it in a refrigerator for 2 hours. Collect the precipitate of hexylresorcinol on a filter, drain thoroughly with the aid of suction, wash with several 1-cc. portions of petroleum benzin, and dry with a current of air: the hexylresorcinol so obtained melts between 62° and 67°, and responds to *Identification tests A* and *B* under *Hexylresorcinol*, page 253.

Assay—Crush in a mortar a counted number of Hexylresorcinol Pills, equivalent to about 800 mg. of hexylresorcinol, triturate well with 25 cc. of methanol, and decant through a filter into a 100-cc. volumetric flask. Triturate the residue in the mortar with 15 cc. of methanol, decant through the same filter, and completely transfer the residue to the filter. Wash the mortar and the filter with portions of methanol until the total filtrate measures exactly 100 cc., and mix well. Transfer exactly 10 cc. of the methanol solution to a 250-cc. iodine flask, add exactly 30 cc. of tenth-normal bromine, follow quickly with 5 cc. of hydrochloric acid, and stopper the flask immediately. Cool the flask under running water, and shake vigorously for 5 minutes, then set aside for 30 minutes, shaking occasionally. Cautiously remove the stopper, add 6 cc. of potassium iodide T.S. and 1 cc. of chloroform, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator toward the end. Perform a blank test with the same quantities of the same reagents and in the same manner and make any necessary correction. Each cc. of tenth-normal bromine is equivalent to 4.857 mg. of $C_{12}H_{18}O_2$.

Packaging and storage—Preserve Hexylresorcinol Pills in well-closed containers.

Sizes—Hexylresorcinol Pills usually available contain the following amounts of hexylresorcinol: 0.1 Gm. (1½ grains) and 0.2 Gm. (3 grains).

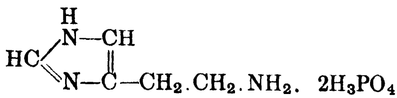
AVERAGE DOSE OF HEXYLRESORCINOL—Anthelmintic, 1 Gm. (approximately 15 grains).

Histamine Phosphate

HISTAMINE PHOSPHATE

Histaminæ Phosphas

Histamin. Phos.—Histamine Acid Phosphate



$C_5H_9N_3 . 2H_3PO_4$ Mol. wt. 307.15

Description—Histamine Phosphate occurs as colorless, odorless, long prismatic crystals. It is stable in air but is affected by light. Its solutions are acid to litmus paper. It melts at about 130°.

Solubility—One Gm. of Histamine Phosphate dissolves in about 4 cc. of water.

Identification—

A: Dissolve 100 mg. of Histamine Phosphate in 7 cc. of water and 3 cc. of sodium hydroxide T.S., and add the solution to a mixture of 50 mg. of sulfanilic acid, 10 cc. of water, 2 drops of hydrochloric acid, and 2 drops of a solution of sodium nitrite (1 in 10): a deep red color is produced.

B: A solution of Histamine Phosphate (1 in 50) is precipitated by phosphotungstic acid T.S.

C: Dissolve 50 mg. of Histamine Phosphate in 5 cc. of hot water, add a hot solution of 50 mg. of picrolonic acid in 10 cc. of alcohol, and allow to crystallize. Filter the crystals with suction, wash with a small amount of ice-cold water, and dry at 100°: the crystals melt between 265° and 268°, page 667.

D: A solution of Histamine Phosphate (1 in 10) responds to the tests for *Phosphate*, page 662.

Loss on drying—When dried at 100° for 1 hour, Histamine Phosphate loses not more than 1.5 per cent of its weight.

Packaging and storage—Preserve Histamine Phosphate in tight, light-resistant containers.

AVERAGE DOSE—Intramuscular, **0.3 mg.** (approximately 1/200 grain).

Histamine Phosphate Injection

HISTAMINE PHOSPHATE INJECTION

Injectio Histaminæ Phosphatis

Inj. Histamin. Phos.—Histamine Phosphate Solution, Histamine Acid Phosphate Injection

Histamine Phosphate Injection is a sterile solution of histamine phosphate in water for injection. It meets the requirements of the *Sterility Test for Liquids*, page 689.

HISTAMINE PHOSPHATE............................	1 Gm.
WATER FOR INJECTION, a sufficient quantity,	
To make..........................	1000 cc.

Prepare a solution, filtering it, if necessary, until clear.

Sterilize Histamine Phosphate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Description—Histamine Phosphate Injection is a colorless or nearly colorless, slightly acid liquid.

Identification—Histamine Phosphate Injection meets the requirements of the *Identification tests* under *Histamine Phosphate*, page 255.

Packaging and storage—Preserve Histamine Phosphate Injection preferably in hermetic containers or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light.

Size—Histamine Phosphate Injection is usually available in 1-cc. ampuls containing 1 mg. ($\frac{1}{60}$ grain) of histamine phosphate.

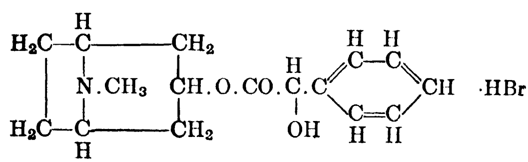
AVERAGE DOSE OF HISTAMINE PHOSPHATE—Intramuscular, **0.3 mg.** (approximately $\frac{1}{200}$ grain).

Homatropine Hydrobromide

HOMATROPINE HYDROBROMIDE

Homatropinæ Hydrobromidum

Homatrop. Hydrobrom.



$C_{16}H_{21}O_3N.HBr$ Mol. wt 356.26

Caution—Homatropine Hydrobromide is extremely poisonous.

Description—Homatropine Hydrobromide occurs as white crystals, or as a white, crystalline powder. It is affected by light. It melts at about 212° with partial decomposition.

Solubility—One Gm. of Homatropine Hydrobromide dissolves in 6 cc. of water, in 40 cc. of alcohol, and in about 420 cc. of chloroform. It is insoluble in ether.

Identification—

A: Iodine T.S. produces a brown precipitate in a solution of Homatropine Hydrobromide.

B: Add a slight excess of ammonia T.S. to 1 cc. of a solution of Homatropine Hydrobromide (1 in 100), shake the mixture with chloroform, and evaporate the chloroform solution to dryness on a water bath. Warm the residue so obtained with about 1.5 cc. of a solution made by dissolving 1 Gm. of mercuric chloride in 50 cc. of a mixture of 5 volumes of alcohol and 3 volumes of water: the mixture is at first yellow and finally becomes brick-red (difference from *most other alkaloids except atropine and hyoscyamine*).

C: Homatropine Hydrobromide responds to the tests for *Bromide*, page 659.

Free acid—A solution of 1 Gm. of Homatropine Hydrobromide in 20 cc. of water requires not more than 0.2 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.
Loss on drying—When dried at 100° for 3 hours, Homatropine Hydrobromide loses not more than 1.5 per cent of its weight.
Residue on ignition—The residue on ignition from 200 mg. of Homatropine Hydrobromide is negligible, page 685.
Atropine, hyoscyamine, or scopolamine—Add 5 drops of nitric acid to about 10 mg. of Homatropine Hydrobromide, and evaporate to dryness in a porcelain dish on a water bath: the residue does not become violet on the addition of a few drops of alcoholic potassium hydroxide T.S.
Most other alkaloids—One cc. of a solution of Homatropine Hydrobromide (1 in 20) yields no precipitate with tannic acid T.S. Another 1-cc. portion of the solution, acidified with hydrochloric acid, yields no precipitate with platinic chloride T.S.
Packaging and storage—Preserve Homatropine Hydrobromide in tight, light-resistant containers.

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DILUTED HYDRIODIC ACID

Acidum Hydriodicum Dilutum

Acid. Hydriod. Dil.

Diluted Hydriodic Acid is a solution containing, in each 100 cc., not less than 9.5 Gm. and not more than 10.5 Gm. of HI, and not less than 0.6 Gm. and not more than 1.0 Gm. of HPH_2O_2.

Caution—Diluted Hydriodic Acid must not be dispensed or used in the preparation of other products if it contains free iodine.

Description—Diluted Hydriodic Acid is a colorless or not more than pale yellow, odorless liquid, strongly acid to litmus paper. Its specific gravity is about 1.1.
Identification—Diluted Hydriodic Acid responds to the tests for *Iodide*, page 661.
Residue on ignition—Evaporate 5 cc. of Diluted Hydriodic Acid to dryness on a water bath, and ignite the residue at a dull red heat. Cool, add 5 drops of sulfuric acid, and again ignite to constant weight: the weight of the residue does not exceed 100 mg.
Chloride—Mix 0.5 cc. of Diluted Hydriodic Acid with 10 cc. of water, and add 8 cc. of silver nitrate T.S. and 6 cc. of ammonium carbonate T.S. Digest the mixture for 10 minutes on a water bath, cool, and filter: upon the addition of nitric acid, the filtrate shows no more *Chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 709.
Free iodine—No blue color is produced by the addition of a few drops of starch T.S. to 5 cc. of Diluted Hydriodic Acid.
Sulfate—A 10-cc. portion of Diluted Hydriodic Acid shows no more *Sulfate* than corresponds to 1 cc. of fiftieth-normal sulfuric acid, page 709.
Arsenic—Mix 5 cc. of Diluted Hydriodic Acid with 1 cc. of nitric acid, and evaporate the liquid to dryness on a water bath: the residue meets the requirements of the test for *Arsenic*, page 618 (0.4 part per million).
Barium—The addition of 1 cc. of diluted sulfuric acid to 10 cc. of Diluted Hydriodic Acid causes no turbidity.

Heavy metals—To 1.8 cc. (2 Gm.) of Diluted Hydriodic Acid add 5 cc. of water and 1 drop of phenolphthalein T.S.; then add enough ammonia T.S. to give the solution a faint pink color. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Diluted Hydriodic Acid is 10 parts per million.

Limit of hypophosphorous acid—To 5 cc. of Diluted Hydriodic Acid, accurately measured, add 5 cc. of water and 15 cc. of hydrogen peroxide T.S., allow the mixture to stand for 15 minutes. Heat the mixture on a water bath until all of the iodine has been volatilized and the solution becomes colorless, then add 1 Gm. of ammonium chloride, 50 cc. of water, and 15 cc. of magnesia mixture T.S. Allow the precipitate to settle for a period of 10 minutes, and add 40 cc. of ammonia T.S. Stir the mixture for 10 minutes, and set it aside for 4 hours at room temperature. Filter, and wash the precipitate with a mixture of 1 volume of ammonia T.S. and 3 volumes of water until free from chloride. Dry the residue and ignite it to constant weight. The weight of magnesium pyrophosphate obtained, multiplied by 0.593, indicates its equivalent in HPH_2O_2. If the hydrogen peroxide T.S. used in this test contains phosphates, a blank test must be run on the reagents and the proper corrections made.

Assay for hydriodic acid—Accurately measure 5 cc. of Diluted Hydriodic Acid into a flask, dilute with 20 cc. of water, add 50 cc. of tenth-normal silver nitrate, and shake the mixture well. Then add 5 cc. of nitric acid, and heat the mixture on a water bath until the precipitate has acquired a bright yellow color. Cool, add 2 cc. of ferric ammonium sulfate T.S., and determine the residual silver nitrate by titration with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 12.79 mg. of HI.

Packaging and storage—Preserve Diluted Hydriodic Acid in tight containers, at a temperature not above 30°.

Hydriodic Acid Syrup

HYDRIODIC ACID SYRUP

Syrupus Acidi Hydriodici

Syr. Acid. Hydriod.

Hydriodic Acid Syrup contains, in each 100 cc., not less than 1.3 Gm. and not more than 1.5 Gm. of HI.

Diluted Hydriodic Acid	140 cc.
Sucrose	450 Gm.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Mix the diluted hydriodic acid with 550 cc. of distilled water, and dissolve the sucrose in this mixture by agitation. Add sufficient distilled water to make the product measure 1000 cc., and filter.

Description—Hydriodic Acid Syrup is a transparent, colorless, or not more than pale, straw-colored, syrupy liquid. It is odorless and has a sweet, acidulous taste. It has a specific gravity of about 1.18.

Identification—Mix 5 cc. of Hydriodic Acid Syrup with a few drops of starch T.S., and add 3 drops of chlorine T.S.: the liquid acquires a deep blue color.

Free iodine—No blue color is produced in Hydriodic Acid Syrup by starch T.S.

Assay—Place exactly 25 cc. of Hydriodic Acid Syrup in a flask, dilute it with 100 cc

of water, add 40 cc. of tenth-normal silver nitrate, agitate the mixture, add 5 cc. of nitric acid, and heat on a water bath until the precipitate has acquired a bright yellow color. Cool, add 2 cc. of ferric ammonium sulfate T.S., and determine the residual silver nitrate by titration with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 12.79 mg. of HI.

Packaging and storage—Preserve Hydriodic Acid Syrup in tight containers, preferably at a temperature not above 25°.

AVERAGE DOSE—4 cc. (approximately 1 fluidrachm).

HYDROCHLORIC ACID

Acidum Hydrochloricum

Acid. Hydrochlor.

Hydrochloric Acid is a solution containing not less than 35 per cent and not more than 38 per cent of HCl.

Description—Hydrochloric Acid is a colorless, fuming liquid having a pungent odor. The fumes and odor of the Acid disappear when it is diluted with 2 volumes of water. It is strongly acid to litmus paper even when highly diluted. Its specific gravity is about 1.18.

Identification—When Hydrochloric Acid is added to potassium permanganate, chlorine is evolved. Hydrochloric Acid responds to the test for *Chloride*, page 659.

Residue on ignition—To 20 cc. of Hydrochloric Acid add 2 drops of sulfuric acid, evaporate to dryness and ignite: not more than 2 mg. of residue remains.

Dilute Hydrochloric Acid with 2 volumes of water and apply the tests which follow for Bromide or iodide, Free bromine or chlorine, Sulfate, Sulfite, and Arsenic.

Bromide or iodide—Add 1 cc. of chloroform to 10 cc. of the dilution, and cautiously add, a drop at a time with constant agitation, chlorine T.S. which has been diluted with an equal volume of water: the chloroform remains free from even a transient yellow, orange, or violet color.

Free bromine or chlorine—Add 1 cc. of potassium iodide T.S. and 1 cc. of chloroform to 10 cc. of the dilution, and agitate the mixture: the chloroform remains free from any violet coloration for at least 1 minute.

Sulfate—Add 5 drops of barium chloride T.S. to a mixture of 3 cc. of the dilution and 5 cc. of water: neither turbidity nor precipitation appears within 1 hour.

Sulfite—On the completion of the test for *Sulfate*, the further addition to the liquid of 2 drops of tenth-normal iodine produces neither turbidity nor decoloration of the iodine.

Arsenic—A 10-cc. portion of the dilution, further diluted with 10 cc. of water, omitting the treatment with sulfuric and sulfurous acids, meets the requirements of the test for *Arsenic*, page 618 (0.6 part per million).

Heavy metals—Evaporate 3.5 cc. (4 Gm.) of Hydrochloric Acid to dryness on a steam bath, add 2 cc. of diluted acetic acid to the residue, and dilute with water to 25 cc.: the heavy metals limit, page 657, for Hydrochloric Acid is 5 parts per million.

Assay—Tare a glass-stoppered flask containing about 20 cc. of water, add about 3 cc. of Hydrochloric Acid, and reweigh. Dilute with about 25 cc. of water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 36.47 mg. of HCl.

Packaging and storage—Preserve Hydrochloric Acid in tight containers.

Hydrochloric Acid, Diluted

DILUTED HYDROCHLORIC ACID

Acidum Hydrochloricum Dilutum

Acid. Hydrochlor. Dil.

Diluted Hydrochloric Acid is a solution containing, in each 100 cc., not less than 9.5 Gm. and not more than 10.5 Gm. of HCl.

Diluted Hydrochloric Acid may be prepared as follows:

HYDROCHLORIC ACID	234 cc.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Mix the ingredients.

Description—Diluted Hydrochloric Acid is a colorless, odorless liquid, strongly acid to litmus paper. Its specific gravity is about 1.05.

Other tests—Diluted Hydrochloric Acid, without further dilution, conforms to the tests for *Identification*, *Residue on ignition*, *Bromide or iodide*, *Free bromine or chlorine*, *Sulfate*, *Sulfite*, and *Arsenic* under *Hydrochloric Acid*, page 259.

Heavy metals—To 9.5 cc. (10 Gm.) of Diluted Hydrochloric Acid add 5 cc. of water and 1 drop of phenolphthalein T.S. Add ammonia T.S. until the solution assumes a faint pink color. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water, the heavy metals limit, page 657, for Diluted Hydrochloric Acid is 5 parts per million.

Assay—Accurately measure 10 cc. of Diluted Hydrochloric Acid, and dilute with about 20 cc. of water. Titrate the solution with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 36.47 mg. of HCl.

Packaging and storage—Preserve Diluted Hydrochloric Acid in tight containers.

AVERAGE DOSE—**4 cc.** (approximately 1 fluidrachm).

Hydrogen Peroxide Solution

HYDROGEN PEROXIDE SOLUTION

Liquor Hydrogenii Peroxidi

Liq. Hydrog. Perox.—Hydrogen Dioxide Solution

Hydrogen Peroxide Solution is a solution containing, in each 100 cc., not less than 2.5 Gm. and not more than 3.5 Gm. of H_2O_2.

Description—Hydrogen Peroxide Solution is a colorless liquid, odorless, or having an odor resembling that of ozone. It is slightly acid to litmus paper and to the taste and produces a froth in the mouth. It usually deteriorates upon standing or upon protracted agitation, and rapidly decomposes when in contact with many oxidizing as well as reducing substances. When rapidly heated, it may decompose suddenly. It is affected by light. Its specific gravity is about 1.01.

Identification—Shake 1 cc. of Hydrogen Peroxide Solution with 10 cc. of water containing 1 drop of diluted sulfuric acid, and add 2 cc. of ether: the subsequent addition of a drop of potassium dichromate T.S. produces an evanescent blue color in the water layer. Upon agitation and standing, this blue color passes into the ether layer.

Non-volatile substances—Evaporate 20 cc. of Hydrogen Peroxide Solution to dryness on a water bath, and dry the residue for 1 hour at 110°: the weight of the residue does not exceed 30 mg.

Acid—It requires not more than 2.5 cc. of tenth-normal sodium hydroxide to neutralize 25 cc. of Hydrogen Peroxide Solution, using phenolphthalein T.S. as the indicator.

Arsenic—Add 1 cc. of ammonia T.S. to 1 cc. of Hydrogen Peroxide Solution, and evaporate the liquid to dryness on a water bath: the residue meets the requirements of the test for *Arsenic*, page 618 (2 parts per million).

Barium—The addition of 2 drops of diluted sulfuric acid to 10 cc. of Hydrogen Peroxide Solution produces no turbidity or precipitate within 10 minutes.

Heavy metals—Dilute 5 cc. of Hydrogen Peroxide Solution with 20 cc. of water, add 2 cc. of ammonia T.S., and gently boil the solution until the volume is reduced to about 5 cc. Add 3 cc. of diluted acetic acid, and dilute with water to 25 cc.: the heavy metals limit, page 657, for Hydrogen Peroxide Solution is 5 parts per million.

Limit of preservative—Extract 100 cc. of Hydrogen Peroxide Solution in a separator with a mixture of 3 volumes of chloroform and 2 volumes of ether, using 50 cc., 25 cc., and 25 cc., respectively, and evaporate the combined extractions to dryness at room temperature in a tared glass dish: the residue, if any, weighs not more than 50 mg.

Assay—Measure accurately 2 cc. of Hydrogen Peroxide Solution, and transfer it to a suitable flask containing 20 cc. of water. Add 20 cc. of diluted sulfuric acid, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 1.701 mg. of H_2O_2.

Packaging and storage—Preserve Hydrogen Peroxide Solution in tight, light-resistant containers, preferably at a temperature not above 35°.

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Hydrous Wool Fat 606

HYOSCYAMUS

Hyoscyamus

Hyosc.—Henbane, Hyoscyami folium P.I.

Hyoscyamus is the dried leaf, with or without the tops, of *Hyoscyamus niger* Linné (Fam. *Solanaceæ*).

Hyoscyamus yields not less than 0.040 per cent of the alkaloids of Hyoscyamus.

Description—

Unground Hyoscyamus—Usually much wrinkled, matted and broken, frequently consisting of leaves, stems, and flowering and fruiting tops. Leaves ovate or ovate-lanceolate, inequilateral, with petioles up to one-third the length of the blade, or sessile; apex acute, margin irregularly dentate or pinnatifid with acute triangular lobes; hairy, densely so on the lower surface; upper surface dark

green, lower surface light gray green; stems from 2 to 7 mm. in thickness, cylindrical or somewhat compressed, longitudinally wrinkled, hairy, gray green; flowers nearly sessile, with an urn-shaped, hairy, unequally 5-toothed calyx and a campanulate, slightly zygomorphic corolla, yellowish with purplish veins; fruit, a 2-locular pyxis enclosed in the calyx; odor distinctive; taste bitter and acrid.

Histology—Leaves: Upper and lower epidermis, in surface view, showing epidermal cells with smooth cuticle, slightly wavy, vertical walls and stomata of solanaceous type and uniseriate non-glandular and glandular hairs. Mesophyll of a layer of palisade parenchyma and a broader zone of spongy parenchyma with large intercellular air spaces, some of the parenchyma cells containing single prisms, twin crystals or rosette aggregates of calcium oxalate; in the midrib a crescent-shaped meristele surrounded by the parenchyma with sphenoidal microcrystals and prisms.

Stems: Cortex and pith of parenchyma containing microcrystals; bundles bicollateral, the xylem with radially arranged groups of pitted, reticulate, spiral and bordered pore tracheæ.

Seed: Campylotropous, subreniform, the coat closely verrucose, the kernel with curved embryo embedded in the endosperm.

Powdered Hyoscyamus—Grayish green to dark green. Hairs, uniseriate; non-glandular hairs unicellular to 10-celled; glandular hairs with 1- to 4-celled stalk and a multicellular head; calcium oxalate crystals in single or twin monoclinic prisms or in rosette aggregates from 10 to 25 microns in diameter; few sphenoidal microcrystals from 6 to 12 microns in length; sclerenchyma fibers attaining a length of 1 mm. and a width of 30 microns, some with wavy walls and ends variously forked; pollen grains nearly smooth with 3 radiating furrows having a pore in the median part of each furrow, when dry or in alcohol distinctly elliptical and approximately 35 by 50 microns, but in water spherical and about 40 microns in diameter; epidermal cells of the seed coat with radial and inner walls greatly thickened and incrusted with granular crystals of silicic acid.

Hyoscyamus stems—The amount of hyoscyamus stems in Hyoscyamus does not exceed 25 per cent and none are over 7 mm. in diameter.

Acid-insoluble ash—Hyoscyamus yields not more than 12 per cent of *Acid-insoluble ash*, pages 710 and 711.

Assay—Proceed as directed under the *Assay* for *Belladonna Leaf*, page 64, using 25 Gm. of Hyoscyamus. Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of Hyoscyamus.

AVERAGE DOSE—**0.2 Gm.** (approximately 3 grains).

Hyoscyamus Tincture

HYOSCYAMUS TINCTURE

Tinctura Hyoscyami

Tr. Hyosc.—Tincture of Henbane, Tinctura Hyoscyami P.I.

Hyoscyamus Tincture yields, from each 100 cc., not less than 3.4 mg. and not more than 4.6 mg. of the alkaloids of hyoscyamus.

HYOSCYAMUS, in moderately coarse powder...........	100 Gm.
To make about.....................	1000 cc.

Prepare a tincture by Process P, as modified for assayed tinctures, page 708, using a mixture of 3 volumes of alcohol and 1 volume of water

as the menstruum. Finally adjust the Tincture to contain, in each 100 cc., 4 mg. of the alkaloids of hyoscyamus.

Assay—Measure accurately 250 cc. of Hyoscyamus Tincture, and evaporate it at a temperature not exceeding 100°, to a volume of about 25 cc. Complete the assay as directed under *Belladonna Tincture*, page 66, beginning with the words, "Transfer the concentrated liquid." Each cc. of fiftieth-normal acid is the equivalent of 5.787 mg. of the alkaloids of hyoscyamus.
Packaging and storage—Preserve Hyoscyamus Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 65 to 70 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—2 cc. (approximately 30 minims).

Hypophosphorous Acid

HYPOPHOSPHOROUS ACID

Acidum Hypophosphorosum

Acid. Hypophosph.

HPH_2O_2 Mol. wt. 66.00

Hypophosphorous Acid is a solution containing not less than 30 per cent and not more than 32 per cent of HPH_2O_2.

Description—Hypophosphorous Acid is a colorless or slightly yellow, odorless liquid. It is acid to litmus paper even when highly diluted. Its specific gravity is about 1.13.
Identification—Hypophosphorous Acid responds to the tests for *Hypophosphite*, page 661.

Hypophosphorous Acid, diluted with 3 volumes of water, meets the requirements of the following tests for *Arsenic*, *Barium*, and *Oxalate:*
Arsenic—Mix 5 cc. of the dilution with 3 cc. of nitric acid and 10 cc. of water, and evaporate the liquid to dryness on a water bath: the residue meets the requirements of the test for *Arsenic*, page 618 (1.5 parts per million).
Barium—Neutralize 30 cc. of the dilution with ammonia T.S.: the mixture exhibits little or no precipitation. Filter, acidulate 10 cc. of the filtrate with hydrochloric acid, and add 2 cc. of potassium sulfate T.S.: no turbidity is produced.
Oxalate—Another 10-cc. portion of the filtrate obtained in the test for *Barium* shows no turbidity upon the addition of 1 cc. of calcium chloride T.S.
Heavy metals—Place 0.9 cc. (1 Gm.) of Hypophosphorous Acid in a small beaker, and dilute with 3 cc. of water. Add 1 cc. of nitric acid, and evaporate on a steam bath to about 1 cc. Again add 1 cc. of nitric acid, and evaporate on the steam bath. Dissolve the residue in 3 cc. of water, add ammonia T.S. until the solution is distinctly alkaline to litmus paper, then boil gently until the odor of ammonia disappears. Add 2 cc. of diluted acetic acid and 15 cc. of warm water, and filter. Dilute the filtrate with water to 25 cc.: the heavy metals limit, page 657, for Hypophosphorous Acid is 20 parts per million.
Assay—Pour about 7 cc. of Hypophosphorous Acid into a tared, glass-stoppered flask, and weigh accurately. Dilute with about 25 cc. of water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 66.00 mg. of HPH_2O_2.
Packaging and storage—Preserve Hypophosphorous Acid in tight containers.

INSULIN INJECTION

Injectio Insulini

Inj. Insulin.—Insulin, Insulin Hydrochloride

Insulin Injection is an acidified solution of the active principle of the pancreas which affects the metabolism of glucose. Insulin Injection, when assayed as directed, shall possess a potency of not less than 95 per cent and not more than 105 per cent of the potency stated on the label, and the potency shall be expressed in U. S. P. Insulin Units which are equivalent in potency to the Unit declared on the label of the container of the *U. S. P. Zinc-Insulin Crystals Reference Standard.*

Insulin Injection is so standardized that each cc. contains either 40, 80 or 100 U. S. P. Insulin Units.

Insulin Injection meets the requirements of the *Sterility Test for Liquids,* page 689.

Description—Insulin Injection is a colorless or almost colorless liquid, free from turbidity and from insoluble matter. Insulin Injection must contain from 0.1 to 0.25 per cent (w/v) of either phenol or cresol. The Injection must contain from 1.4 to 1.8 per cent (w/v) of glycerin.

Identification—

A: Inject subcutaneously into six rabbits, from which food has been withheld for the previous 18 to 24 hours and which weigh from 1.8 to 2.2 Kg. each, a quantity of Insulin Injection which causes convulsions in at least three animals. Immediately after convulsions occur in an animal, inject intravenously into that animal 5 cc. of a 50 per cent solution of dextrose: the convulsion is relieved. A majority of the animals which have shown convulsions remain alive for at least 3 days.

B: Adjust the acidity of Insulin Injection to a pH between 5.1 and 5.3: a precipitate forms which dissolves when the reaction is adjusted to a pH between 2.5 and 3.5. Insulin Injection shows, at most, only a slight haze when adjusted to a pH between 8.0 and 8.5.

Reaction—The pH of Insulin Injection is between 2.5 and 3.5, employing a glass electrode.

Determine from the label of the container the quantities of Insulin Injection sufficient to make the tests which follow for Total nitrogen, Zinc, and Residue on ignition.

Total nitrogen—Transfer a quantity of Insulin Injection, representing not less than 200 U. S. P. Insulin Units, to a Kjeldahl flask of suitable capacity. Determine the total nitrogen, *Method II,* page 672. The quantity of nitrogen found for each 100 U. S. P. Insulin Units does not exceed 0.65 mg. for Insulin Injection made from zinc-insulin crystals, and not more than 0.85 mg. for Insulin Injection other than that made from zinc-insulin crystals.

Zinc—When determined as directed under *Zinc in Insulin Injection,* page 727, the zinc content in each 1000 U. S. P. Insulin Units shall be not less than 0 16 mg. and not more than 0.4 mg. for Insulin Injection made from zinc-insulin crystals, and not more than 0.4 mg. for Insulin Injection other than that made from zinc-insulin crystals.

Residue on ignition—Concentrate slowly in a tared platinum dish a volume of Insulin Injection equivalent to not less than 500 U. S. P. Insulin Units. When dry, add to the residue 2 drops of nitric acid, and ignite at first very gently over a Bun-

sen flame, then gradually raise the temperature until the carbon which may appear is completely dissipated. Place in a muffle furnace at dull red to medium red heat for 15 minutes. Cool the dish and contents in a desiccator, and weigh: the residue so obtained corresponds to not more than 1.0 mg. per 1000 U. S. P. Insulin Units.

Assay—

Standard solution—Dissolve a suitable quantity of U. S. P. Zinc-Insulin Crystals Reference Standard, accurately weighed, in sufficient water, containing between 0.1 and 0.25 per cent (w/v) of either phenol or cresol, between 1.4 and 1.8 per cent (w/v) of glycerin, and sufficient hydrochloric acid to make a *Standard Solution* containing 20 U. S. P. Insulin Units in each cc. and having a pH between 2.5 and 3.5. Store in a cold place protected from freezing until used. Do not use after six months.

Dilution of the standard solution—Dilute the *Standard Solution* to contain a known concentration, not less than 1.25 and not more than 2.5, of U. S. P. Insulin Units in each cc., using a solution containing between 0.1 and 0.25 per cent (w/v) of either phenol or cresol, between 1.4 and 1.8 per cent (w/v) of glycerin, and sufficient hydrochloric acid to produce a pH of from 2.5 to 3.5.

Volume of the dilution of the standard solution to be injected—The volumes of the solution injected should be sufficiently great to provide that at the time of the final bleeding the average blood-sugar level shall not be greater than approximately 90 per cent of the average initial value; but the volumes of the solution injected shall not be so great that convulsions are caused in more than 25 per cent of the animals. For each animal the volume injected of the *Dilution of the preparation to be assayed* shall be identical with the volume injected of the *Dilution of the standard solution to be injected.*

Dilution of the preparation to be assayed—Determine the approximate potency of the preparation to be assayed. Employ the same diluent used in preparing the *Dilution of the standard solution* to make three dilutions of the preparation to be assayed to contain the same number of U. S. P. Insulin Units in each cc. as the *Dilution of the standard solution* on the basis of the following assumptions: (*a*) That the sample contains 89.3 per cent of the approximate potency (Dilution 1); (*b*) that the sample contains 100 per cent of the approximate potency (Dilution 2); (*c*) that the sample contains 112 per cent of the approximate potency (Dilution 3).

Test animal—Select for assay purposes healthy rabbits weighing at least 1.5 Kg. and otherwise suitable. Keep the animals in the laboratory for at least 1 week before use in a test, and feed an adequate, uniform diet, with water available at all times. Mark the rabbits for identification, and use them at intervals of not less than 6 days as long as they remain suitable.

Conduct of the assay—Divide the rabbits into six groups of at least three rabbits each. Place the rabbits in individual cages, and withhold all food, except water, for approximately 24 hours before the test. During the test withhold both food and water until after the final blood sample has been taken. Handle the rabbits with care in order to avoid any undue excitement. Obtain slightly more than 1 cc. of blood from a small incision in the marginal vein of the ear, collecting the blood in a suitable vessel containing about 3 mg. of sodium oxalate. After obtaining this sample of blood for the determination of the initial blood-sugar concentration, inject subcutaneously the dose of the appropriate solution.

The plan of injection shall be as follows:

Group	*Solutions to be injected*
1	Dilution of the standard solution
2	Dilution 1 of the preparation to be assayed
3	Dilution of the standard solution
4	Dilution 2 of the preparation to be assayed
5	Dilution of the standard solution
6	Dilution 3 of the preparation to be assayed

About one week later inject the same volumes into the same animals as follows:

Group	Solutions to be injected
1	Dilution 1 of the preparation to be assayed
2	Dilution of the standard solution
3	Dilution 2 of the preparation to be assayed
4	Dilution of the standard solution
5	Dilution 3 of the preparation to be assayed
6	Dilution of the standard solution

At 1½, 3, and at a time between 4 and 5½ hours from the time of injection, obtain samples of blood from each rabbit in the manner followed for the determination of the initial blood-sugar concentration. Using at least eighteen rabbits in each of the six groups of the plan described above, determine the relationship of each of the three dilutions of the preparation to be assayed to the dilution of the standard solution.

Blood-sugar determination—Lake 1 cc. of the blood obtained as previously directed with 8 cc. of *Acid zinc sulfate solution,* prepared as directed below, in a clean dry flask or test tube, and add 1 cc. of a solution prepared by mixing 81 cc. of normal sodium hydroxide with sufficient water to make 100 cc. Stopper, shake vigorously, allow to stand for a few minutes, and then filter through a dry filter into a clean, dry vessel. Accurately measure from 2 to 5 cc. of the filtrate into exactly 5 cc. of alkaline cupric iodide T.S., contained in a 25- x 200-mm. test tube. Mix gently, close the tube with a glass bulb or other suitable loose stopper or cover, and place in a metal rack so constructed as to prevent agitation of the tubes while in a bath of boiling water. Immerse the rack and tubes to a depth of about 10 cm. in the boiling water for 20 minutes. Cool rapidly to about 30° by immersion in water, avoiding agitation. Acidify with 5 cc. of normal sulfuric acid, mix gently, allow to stand for at least 1 minute, and then titrate with two-hundredth-normal sodium thiosulfate, prepared on the day it is used. When the iodine color becomes quite pale, 1 cc. of starch T.S. may be added to facilitate the determination of the end-point. Perform a blank test with the same quantities of the same reagents and in the same manner, replacing the blood filtrate with a corresponding amount of water. The difference between the number of cc. of the thiosulfate solution consumed by the blank and by the blood filtrate, multiplied by 113 and divided by the number of cc. of blood filtrate used in the test, indicates the blood-sugar value in mg. in each 100 cc.

Acid zinc sulfate solution—Dissolve 12.5 Gm. of zinc sulfate ($ZnSO_4.7H_2O$) in about 200 cc. of water, add 31.25 cc. of normal sulfuric acid and sufficient water to make exactly 1000 cc., and mix well. Measure accurately 50 cc. of the solution so prepared, add 3 drops of phenolphthalein T.S., and, with continuous stirring, slowly titrate with sodium hydroxide solution, made by mixing exactly 81 cc. of normal sodium hydroxide with sufficient water to make 100 cc., until a permanent pink color is produced: not less than 6.2 cc. and not more than 6.30 cc. of the sodium hydroxide solution is required.

Interpretation of the data—From the initial blood-sugar concentration subtract the average of the concentration observed at the three bleeding times subsequent to the injection, and express the difference as the percentage of the initial concentration. Combine all of the percentages obtained from the rabbits which received the same *Dilution of the preparation to be assayed* in such a way that the index of the relative effect of the *Dilution of the preparation to be assayed,* compared with that of the *Dilution of the standard solution,* can be calculated by the following formula:

$$\text{Index} = \frac{\text{Average percentage reduction effected by the } \textit{Dilution of the preparation to be assayed}}{\text{Average percentage reduction effected by the } \textit{Dilution of the standard solution}} \times 100$$

Calculate the index for each of the three *Dilutions of the preparation to be assayed.* Determine graphically the potency of the preparation to be assayed by plotting three points on a graph, using each index as the ordinate and the corresponding assumed potency in U. S. P. Insulin Units in each cc. as the abscissa. The potency in U. S. P. Insulin Units in each cc. of the preparation to be assayed is indicated

by the abscissa of the point of intersection of the line of best fit with a horizontal extended from the ordinate of 100.

Should the results indicate that the potency of the preparation to be assayed lies outside of the limits of the assumed potencies, make other assumptions and repeat the assay until the observed potency is within the range of assumed potencies.

Packaging and storage—Preserve Insulin Injection at a temperature above 0° but not exceeding 15°, avoiding freezing. It must be dispensed in a satisfactory, unopened, multiple-dose container in which it was placed by the manufacturer, which container shall be of approximately 10-cc. capacity, and shall contain not less than 10 cc. of the Injection.

Labeling—The label of the Insulin Injection container and the outside label of each retail package must state the potency in U. S. P. Insulin Units per cc. The outside labeling of each retail package shall also state a date of expiration which must not be later than two years after the date of its removal for distribution from the manufacturer's place of storage, the temperature of which shall be above 0° but shall not exceed 15°.

Insulin Injection made from zinc-insulin crystals may be labeled—"Insulin made from Zinc-Insulin Crystals."

AVERAGE DOSE—Insulin Injection is administered by injection usually into the loose subcutaneous tissue. At times it is administered intravenously. The dose of Insulin Injection is to be determined by the physician in accordance with the needs of the patient.

Insulin, Protamine Zinc, Injection

PROTAMINE ZINC-INSULIN INJECTION

Injectio Zinco-Insulini Protaminati

Inj. Zinco-Insulin. Protam.

Protamine Zinc-Insulin Injection is a suspension, in a buffered water medium, of insulin modified by the addition of zinc chloride and protamine. The protamine is prepared from the sperm or from the mature testes of fish belonging to the genera *Oncorhynchus* Suckley, *Salmo* Linné, or *Trutta*, Jordan and Evermann (Fam. *Salmonidæ*), and conforms to the regulations of the Food and Drug Administration concerning certification of batches of drugs composed wholly or partly of insulin.

In the preparation of Protamine Zinc-Insulin Injection, the amount of insulin used is sufficient to provide either 40 or 80 U. S. P. Insulin Units for each cc. of the Injection.

Protamine Zinc-Insulin Injection meets the requirements of the *Sterility Test for Liquids*, page 689.

Note—Protamine Zinc-Insulin Injection differs in its action from that of Insulin Injection, page 265, both in time of onset and duration. To secure accuracy of dosage, the preparation must be brought into uniform suspension by careful shaking before use.

Description—Protamine Zinc-Insulin Injection is a white, or almost white, suspension and is free from large particles following moderate agitation. Protamine Zinc-Insulin Injection must contain from 1.4 to 1.8 per cent (w/v) of glycerin, and either from 0.18 to 0.22 per cent (w/v) of cresol or from 0.22 to 0.28 per cent (w/v) of phenol. It must contain from 0.15 to 0.25 per cent (w/v) of sodium phosphate. It must contain from 0.20 to 0.25 mg. of zinc and from 1.0 to 1.5 mg. of protamine for each 100 U. S. P. Units of Insulin.

Identification—

A: Acidify Protamine Zinc-Insulin Injection to a pH between 2.5 and 3.5: the precipitate dissolves, producing a clear, colorless liquid.

B: Inject subcutaneously into six rabbits from which food had been withheld for the previous 18 to 24 hours, and which weigh from 1.8 to 2.2 Kg. each, a quantity of Protamine Zinc-Insulin Injection, acidified as indicated above, which causes convulsions in at least three animals. Immediately after convulsions occur in an animal, inject intravenously into that animal 5 cc. of a 50 per cent solution of dextrose: the convulsion is relieved. A majority of the animals which have shown convulsions remain alive for at least 3 days.

Reaction—The pH of Protamine Zinc-Insulin Injection, determined with a glass electrode, is between 7.1 and 7.4.

Total nitrogen—Transfer a quantity of Protamine Zinc-Insulin Injection, representing not less than 200 U. S. P. Insulin Units, to a Kjeldahl flask of suitable capacity, and determine the total nitrogen by *Method II*, page 672. The quantity of nitrogen found does not exceed 1.25 mg. for each 100 U. S. P. Insulin Units.

Zinc—When determined as directed under *Zinc in Insulin Injection*, page 727, the zinc content of Protamine Zinc-Insulin Injection is between 0.20 mg. and 0.25 mg. for each 100 U. S. P. Insulin Units.

Biological reaction—

Solution 1. Dissolve 183 mg. of zinc oxide in 60 cc. of approximately tenth-normal hydrochloric acid. Add 16 Gm. of glycerin, 2.5 Gm. of phenol (or 2 Gm. of cresol), and sufficient water to make 1000 cc. of solution.

Solution 2. Dissolve 4 Gm. of sodium phosphate (calculated as Na_2HPO_4), 16 Gm. of glycerin, and 2.5 Gm. of phenol (or 2 Gm. of cresol) in sufficient water to make 1000 cc. of solution, and adjust the reaction with either sodium hydroxide or with hydrochloric acid, if necessary.

Solution 3. Dissolve not less than 100 mg. of *U. S. P. Protamine Reference Standard* in *Solution 1*, in the proportion of 1 mg. for each cc. Preserve in a cold place protected from freezing. Do not use after 6 months.

Solution 4. Dissolve a suitable quantity of U. S. P. Zinc-Insulin Crystals Reference Standard, accurately weighed, in a sufficient quantity of *Solution 3* to make a solution containing 80 U. S. P. Insulin Units in each cc. If necessary, add 1 drop of diluted hydrochloric acid to effect complete solution. Preserve in a cold place protected from freezing. Do not use after 6 months.

Standard preparation of protamine zinc-insulin, 40 U. S. P. Insulin Units per cc.—To a suitable volume of *Solution 4*, accurately measured, add an equal volume of *Solution 2*, with gentle shaking, test the reaction, and if the pH is not between 7.1 and 7.4, discard and prepare a new mixture using a freshly prepared sample of *Solution 2* in which the hydrogen ion concentration has been suitably adjusted by the addition of a solution of either sodium hydroxide or hydrochloric acid Preserve in a cold place protected from freezing. Do not use before 2 days nor after 6 months.

Standard preparation of protamine zinc-insulin, 80 U. S. P. Insulin Units per cc.—Prepare the standard to contain 80 U. S. P. Insulin Units in each cc. according to the method described for the protamine zinc insulin standard containing 40 U. S. P. Insulin Units per cc. with zinc and protamine in the same relative proportions per U. S. P. Insulin Unit.

Test animal—Use the *Test animal* described for the *Assay* of *Insulin Injection*, page 265.

Volume of the standard preparation of protamine zinc-insulin to be injected—Determine the volume to be injected in the same manner as described for *Volume of the dilution of the standard solution to be injected* under the *Assay* of *Insulin In-*

jection, page 265. For each animal the volume injected of the preparation to be tested shall be identical with the volume injected of the *Standard* preparation.

Conduct of the test—Divide the rabbits into two similar groups of approximately equal number. Place the rabbits in individual cages, and withhold all food, except water, for approximately 24 hours before the test. During the test withhold both food and water until the final sample of blood has been taken. Handle the rabbits with care in order to avoid any undue excitement. Obtain slightly more than 1 cc. of blood from a small incision in the marginal vein of the ear, collecting the blood in a suitable vessel containing about 3 mg. of sodium oxalate. After obtaining this sample of blood for the determination of the initial blood-sugar concentration, as directed in the *Assay* of *Insulin Injection*, page 265, inject subcutaneously, without dilution, into the rabbits of one group, the appropriate volume (determined as directed above) of the standard preparation of protamine zinc insulin of the same strength as the potency declared on the label of the preparation to be tested, and into the rabbits of the other group the appropriate volume of the preparation to be tested. In the same manner as for the determination of the initial blood sugar concentration, obtain at least five samples of blood from each rabbit at intervals of 1½ to 3 hours, over a period of not less than 11 hours after the injection, and determine the blood-sugar concentration in each. About 1 week later inject the preparation being tested into each rabbit of the group which previously received the *Standard preparation of protamine zinc-insulin;* in a similar manner inject the *Standard preparation of protamine zinc-insulin* into each rabbit of the group which previously received the preparation being tested. Obtain samples of blood in the same manner as previously described and determine the concentration of blood-sugar in each. The results on a total of not less than 30 rabbits shall constitute a test.

Interpretation of the data—Subtract the average blood-sugar concentration at each bleeding time for those rabbits injected with the preparation being tested from the average blood-sugar concentration at the comparable bleeding time for those rabbits injected with the standard preparation of protamine zinc-insulin. The average blood-sugar concentrations at each bleeding time do not differ by more than 5 mg. per 100 cc., except that at the final bleeding time the average blood-sugar concentrations may differ by as much as 8 mg. per 100 cc. Obtain the average of the differences for all bleeding times after the injection, taking into account the sign of each difference: the value obtained does not exceed the limits of plus or minus 3.

Biological activity of the supernatant liquid—

Standard solution—Prepare the *Standard solution*, described for the *Assay* of *Insulin Injection*, page 265.

Diluent for standard solution and the supernatant liquid—Prepare a solution containing between 0.10 and 0.25 per cent (w/v) of either phenol or cresol, between 1.4 and 1.8 per cent (w/v) of glycerin, and sufficient hydrochloric acid to produce a pH of from 2.5 to 3.5.

Dilution of the standard solution—Dilute the *Standard solution* with the *Diluent* so that 0.25 cc. of the *Dilution of the Standard solution* will cause convulsions in approximately 50 per cent of the test animals, but in no case in less than 30 per cent and not more than 70 per cent of the test animals.

Dilution of the supernatant liquid—Centrifuge Protamine Zinc-Insulin Injection. For Protamine Zinc-Insulin Injection containing 40 U. S. P. Insulin Units per cc., assume that the supernatant liquid contains 1 U. S. P. Insulin Unit per cc., and for Protamine Zinc-Insulin Injection containing 80 U. S. P. Insulin Units per cc., assume that the supernatant liquid contains 1.5 U. S. P. Insulin Units per cc. Dilute a portion of the supernatant liquid with the *Diluent* so that the final concentration of insulin is the same as the concentration of insulin in the *Dilution of the standard solution.*

Test animal—Use healthy white mice weighing not less than 17 Gm. and not more than 21 Gm., and otherwise suitable. Withhold all food, except water, for at least 5 hours before the test. Divide the mice into two groups, and identify by an appropriate mark all the mice of one group.

Conduct of the test—Inject subcutaneously 0.25 cc. of the *Dilution of the standard*

solution into each mouse of one group and 0.25 cc. of the *Dilution of the supernatant liquid* into each mouse of the other group. Inject a total of not less than 100 mice with each dilution. After injection, place the mice in containers, suitably ventilated and maintained at a uniform temperature of not less than 32° and not more than 38°, so that each container will have an equal number of mice from each group. During the test the temperature must not fluctuate more than plus or minus 1°. Withhold food and water. Observe the mice for not less than 60 minutes and not more than 90 minutes after injection, observing all for the same length of time, and record the number which are in collapse or show convulsions: the number of mice in which collapse or convulsions are observed following the injection of the *Dilution of the supernatant liquid* does not exceed the number of mice in which collapse or convulsions are observed following the injection of the *Dilution of the standard solution.*

Packaging and storage—Preserve Protamine Zinc-Insulin Injection at a temperature above 0° but not exceeding 15°, avoiding freezing. It must be dispensed in a satisfactory, unopened, multiple-dose container in which it was placed by the manufacturer, which container shall be of approximately 10-cc. capacity and shall contain not less than 10 cc. of the Injection. See *General Notices, The Container,* page 4.

Labeling—The label of the Protamine Zinc-Insulin Injection container and the outside label of each retail package must state the potency in units per cc. This refers to the number of U. S. P. Insulin Units which were added per cc. for the preparation of the Injection. The outside labeling of each retail package shall also state a date of expiration which must not be later than 18 months after the immediate container therein was filled.

AVERAGE DOSE—Protamine Zinc-Insulin Injection is administered by injection usually into the loose subcutaneous tissue. It is never administered intravenously. The dose of Protamine Zinc-Insulin Injection is to be determined by the physician in accordance with the needs of the patient.

Iodine

IODINE

Iodum

Iod.

I At. wt. 126.92

Iodine contains not less than 99.8 per cent of I.

Description—Iodine occurs in the form of heavy, grayish black plates or granules, having a metallic luster and a characteristic odor.

Solubility—One Gm. of Iodine dissolves in about 2950 cc. of water, in 13 cc. of alcohol, in about 80 cc. of glycerin, and in about 4 cc. of carbon disulfide. It is freely soluble in chloroform, in carbon tetrachloride, and in ether, and is soluble in solutions of iodides.

Identification—

A: Solutions of Iodine in alcohol and in solutions of iodides have a reddish brown color.

B: Solutions of Iodine (1 in 1000) in chloroform, in carbon tetrachloride, or in carbon disulfide have a violet color.

C: Add starch T.S. to a saturated solution of Iodine: a blue color is produced. When the mixture is boiled, the color vanishes but reappears as it cools, unless it has been subjected to long-continued boiling.

Non-volatile residue—When volatilized on a steam bath, Iodine leaves not more than 0.05 per cent of residue.

Chloride or bromide—Triturate 500 mg. of finely powdered Iodine with 20 cc. of water, and filter the solution. To one-half of the filtrate add, drop by drop, sulfurous acid (free from chloride), previously diluted with several volumes of water, until the iodine color just disappears. Add 5 cc. of ammonia T.S., and follow with 5 cc. of silver nitrate T.S. in small portions. Filter, and acidify the filtrate with nitric acid: the resulting liquid is not more turbid than a control made with the same quantities of reagents to which 0.1 cc. of fiftieth-normal hydrochloric acid has been added, omitting the sulfurous acid.

Assay—Place about 500 mg. of powdered Iodine in a tared weighing bottle, stopper, weigh accurately, and add 1 Gm. of potassium iodide, dissolved in 5 cc. of water. Dilute this solution with water to about 50 cc., add 1 cc. of diluted hydrochloric acid, and titrate with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 12.69 mg. of I.

Packaging and storage—Preserve Iodine in tight containers.

Iodine Solution, Strong

STRONG IODINE SOLUTION

Liquor Iodi Fortis

Liq. Iod. Fort.—Compound Iodine Solution, Lugol's Solution

Strong Iodine Solution contains, in each 100 cc., not less than 4.5 Gm. and not more than 5.5 Gm. of iodine (I), and not less than 9.5 Gm. and not more than 10.5 Gm. of KI.

Iodine	50 Gm.
Potassium Iodide	100 Gm.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Dissolve the iodine and potassium iodide in 100 cc. of distilled water, then add a sufficient quantity of distilled water to make the product measure 1000 cc.

Description—Strong Iodine Solution is a transparent liquid having a deep brown color and the odor of iodine.

Identification—

A: A drop of Strong Iodine Solution added to 1 cc. of starch T.S., previously diluted with 10 cc. of water, produces a deep blue color.

B: Evaporate a few cc. of the Solution to dryness on a steam bath, and ignite gently to volatilize any free iodine: the residue responds to the *Identification tests* for *Potassium*, page 663, and for *Iodide*, page 661.

Assay for iodine—Place exactly 5 cc. of Strong Iodine Solution in a 500-cc. glass-stoppered flask, and add 25 cc. of water. Titrate with tenth-normal potassium arsenite, using starch T.S. as the indicator. Each cc. of tenth-normal potassium arsenite is equivalent to 12.69 mg. of I.

Assay for potassium iodide—To the titrated solution obtained in the *Assay for iodine* add 50 cc. of hydrochloric acid and 5 cc. of chloroform, cool to room temperature, then titrate with twentieth-molar potassium iodate until the purple color of iodine disappears from the chloroform. The last portions of the iodate solution must be added in drops, the mixture being agitated vigorously and continuously. After the chloroform has been decolorized, allow the mixture to stand for 5 minutes. If the chloroform develops a purple color, the mixture should be titrated further with the iodate solution. The difference between the number of cc. of twentieth-molar potassium iodate used and the number of cc. of tenth-normal potassium arsenite used, multiplied by 0.01660, represents the number of Gm. of KI in the volume of the Solution taken for the assay.

Packaging and storage—Preserve Strong Iodine Solution in tight containers, preferably at a temperature not above 35°.

AVERAGE DOSE—**0.3 cc.** (approximately 5 minims).

Iodine Tincture

IODINE TINCTURE

Tinctura Iodi

Tr. Iod.—Mild Tincture of Iodine U. S. P. XII

Note—The strength of Iodine Tincture has been reduced from 7 Gm. of iodine in each 100 cc. (U. S. P. XII) to 2 Gm. of iodine in each 100 cc.

Iodine Tincture contains, in each 100 cc., not less than 1.8 Gm. and not more than 2.2 Gm. of I, and not less than 2.1 Gm. and not more than 2.6 Gm. of NaI.

Iodine Tincture may be prepared as follows:

IODINE	20 Gm.
SODIUM IODIDE	24 Gm.
DILUTED ALCOHOL, a sufficient quantity,	
To make	1000 cc.

Dissolve the iodine and sodium iodide in a sufficient quantity of diluted alcohol to make the product measure 1000 cc.

Description—A transparent liquid having a reddish brown color and the odors of iodine and of alcohol.

Identification—

A: Add 1 drop of Iodine Tincture to a mixture of 1 cc. of starch T.S. and 9 cc. of water: a deep blue color is produced.

B: Evaporate a few cc. of the Tincture to dryness on a steam bath: the residue responds to the flame test for *Sodium*, page 663.

Assay for iodine—Proceed as directed under *Strong Iodine Solution*, page 272, but using 10 cc. of the Tincture.

Assay for sodium iodide—Proceed as directed under *Strong Iodine Solution*, page 272. The difference between the number of cc. of twentieth-molar potassium iodate used and the number of cc. of tenth-normal potassium arsenite used, multiplied by

0.01499, represents the number of Gm. of NaI in the volume of Tincture taken for the assay.
Alcohol content—From 44 to 50 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Iodine Tincture in tight containers.

Iodized Oil

IODIZED OIL

Oleum Iodatum

Ol. Iodat.

Iodized Oil is an iodine addition product of vegetable oils, containing not less than 38 per cent and not more than 42 per cent of organically combined iodine (I).

Description—Iodized Oil is a thick, viscous, oily liquid, having an alliaceous odor and an oleaginous taste. Iodized Oil decomposes on exposure to air and sunlight, becoming dark brown in color.

Solubility—Mix 1 cc. of Iodized Oil with 10 cc. of petroleum benzin: a clear solution results.

Identification—Mix 0.2 cc. of Iodized Oil with 1 Gm. of anhydrous sodium carbonate in a small porcelain crucible, cover it with 1 Gm. of anhydrous sodium carbonate, well pressed down, and heat the crucible rapidly and strongly for 10 minutes. Allow the crucible and contents to cool, and dissolve the residue in 20 cc. of hot water. Filter the solution, and add hydrochloric acid cautiously until effervescence ceases. Place 10 cc. of the solution in a test tube, and add 2 cc. of chloroform and a few drops of chlorine T.S.: upon being shaken, the chloroform layer becomes violet colored.

Free acid—Dissolve 1 cc. of Iodized Oil in 10 cc. of chloroform in a glass-stoppered cylinder, add 3 drops of phenolphthalein T.S. and 0.3 cc. of tenth-normal sodium hydroxide, stopper, and shake the mixture vigorously: the mixture becomes red.

Residue on ignition—Iodized Oil yields not more than 0.1 per cent of residue on ignition, page 685.

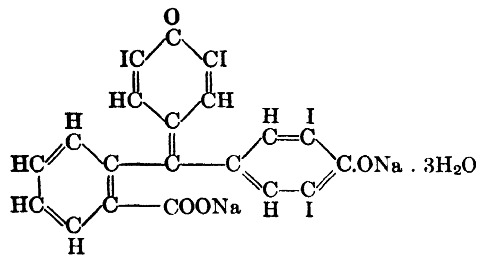
Assay—Mix about 350 mg. of Iodized Oil, accurately weighed, with 2 Gm. of anhydrous sodium carbonate in a small crucible, and completely fill the crucible with anhydrous sodium carbonate, well pressed down; invert the crucible and contents in a larger crucible, and add sufficient anhydrous sodium carbonate to seal the junction of the two crucibles. Heat rapidly and strongly in a muffle furnace, and maintain the crucibles and mass at dull redness for 20 minutes. Allow the crucibles and contents to cool, and dissolve the residue in 100 cc. of hot water in a beaker. Filter the hot solution into a 500-cc. flask, and wash the beaker, crucibles, and filter with three 10-cc. portions of hot water. Allow the filtrate and washings to cool, add 2 drops of sodium bisulfite solution (1 in 5) and add nitric acid (1 in 2) in small portions until effervescence ceases, then add 2 cc. in excess. Now add, dropwise, a dilute solution of potassium permanganate, prepared by mixing 1 cc. of 1 in 15 solution with 49 cc. of water, until a faint yellow color appears. Add 0.5 cc. of starch T.S., and titrate with tenth-normal silver nitrate until the blue color is just discharged, leaving a canary yellow precipitate. Each cc. of tenth-normal silver nitrate is equivalent to 12.69 mg. of iodine (I).

Packaging and storage—Preserve Iodized Oil in well-filled, tight, light-resistant containers.

IODOPHTHALEIN SODIUM

Iodophthaleinum Sodicum

Iodophthal. Sod.—Soluble Iodophthalein, Tetraiodophenolphthalein Sodium, Tetraiodophthalein Sodium, Tetiothalein Sodium



$C_{20}H_8I_4O_4Na_2.3H_2O$ Mol. wt. 919.99

Iodophthalein Sodium is the disodium salt of tetraiodophenolphthalein. It contains not less than 85 per cent of tetraiodophenolphthalein. The separated tetraiodophenolphthalein contains not less than 60 per cent and not more than 63 per cent of iodine (I).

Description—Iodophthalein Sodium is a pale blue-violet, odorless, crystalline powder, having a saline and astringent taste. On exposure to air it absorbs carbon dioxide and gradually decomposes with the liberation of the free phthalein.

Solubility—One Gm. of Iodophthalein Sodium dissolves in about 7 cc. of water; it is slightly soluble in alcohol.

Identification—

A: To 10 cc. of a solution of Iodophthalein Sodium (1 in 50) add enough diluted hydrochloric acid, dropwise, to make the mixture acid: a cream-colored precipitate is formed.

B: Mix about 100 mg. of Iodophthalein Sodium with 500 mg. of monohydrated sodium carbonate, and ignite until thoroughly charred. Cool, add 5 cc. of hot water, heat for 5 minutes on a steam bath, and filter: the solution responds to the test for *Iodides*, page 661.

C: Iodophthalein Sodium responds to the flame test for *Sodium*, page 663.

Free phthalein—One Gm. of Iodophthalein Sodium dissolves completely in 50 cc. of recently boiled and cooled water, producing a clear, deep blue solution. On standing in contact with air, this solution may absorb carbon dioxide and develop a precipitate of free iodophthalein.

Assay for tetraiodophenolphthalein—Weigh accurately about 500 mg. of Iodophthalein Sodium in a stoppered weighing-bottle, and transfer it completely to a beaker with about 50 cc. of water. When solution is complete, add, with stirring, 20 cc. of diluted hydrochloric acid, and allow to stand for 30 minutes. Filter through a tared filtering crucible, prepared with a disk of filter paper. Wash the precipitate with 50 cc. of a mixture of equal volumes of diluted hydrochloric acid and hot water, using small portions at a time. Remove the excess of liquid by the use of suction, and dry the precipitate of tetraiodophenolphthalein to constant weight at 110°. The weight of the precipitate corresponds to not less than 85 per cent of the weight of the Iodophthalein Sodium taken for the assay.

Assay for iodine—Place about 200 mg., accurately weighed, of the tetraiodophenolphthalein obtained in the *Assay for tetraiodophenolphthalein*, in a 500-cc. Erlen-

meyer flask, and add 15 cc. of sodium hydroxide T.S. Warm gently until the substance has dissolved, add 25 cc. of a solution of potassium permanganate (1 in 15), add several glass beads, place a small short-stemmed funnel in the neck of the flask, and boil gently for 10 minutes. Allow the mixture in the flask to cool to room temperature, wash the funnel and walls of the flask with 75 cc. of water, and add 10 cc. of dilute sulfuric acid (1 in 2). Add, in one portion, 15 cc. of a solution of sodium bisulfite (1 in 5), and, when the solution has become colorless, cool, and then add the solution of potassium permanganate, dropwise, until a yellow color appears. At once add the solution of sodium bisulfite, dropwise, until the yellow color is again discharged. Now add, dropwise, a dilute solution of potassium permanganate, prepared by mixing 1 cc. of the 1 in 15 solution with 49 cc. of water, until a faint yellow color appears. Add 0.5 cc. of starch T.S., and titrate with tenth-normal silver nitrate until the blue color is just discharged, leaving a canary yellow precipitate. Each cc. of tenth-normal silver nitrate is equivalent to 12.69 mg. of iodine (I).

Storage—Preserve Iodophthalein Sodium in tight containers.

AVERAGE DOSE—For each 10 Kilograms of body weight—
Oral, **0.5 Gm.** (approximately $7\frac{1}{2}$ grains).
Intravenous, **0.3 Gm.** (approximately 5 grains).

Iodopyracet Injection

IODOPYRACET INJECTION

Injectio Iodopyraceti

Inj. Iodopyr.

Iodopyracet Injection is a sterile solution of the diethanolamine salt of 3,5-diiodo-4-pyridone-N-acetic acid [$C_5H_2I_2ONCH_2COONH_2(CH_2CH_2OH)_2$] in water for injection. It contains, in each 100 cc., not less than 34 Gm. and not more than 36 Gm. of the salt. The separated 3,5-diiodo-4-pyridone-N-acetic acid, when dried at 100°, contains not less than 61.5 per cent and not more than 63.5 per cent of iodine (I). It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize *Iodopyracet Injection* preferably by Process C. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Description—Iodopyracet Injection occurs as a clear and nearly colorless liquid. It is neutral to litmus paper. Its specific gravity is about 1.185.

Identification—

A: Dilute 5 cc. of Iodopyracet Injection with 10 cc. of water, and add a slight excess of diluted hydrochloric acid. Collect the liberated acid on a filter and wash thoroughly with cold water. The precipitate, when dried at 100°, melts between 245° and 249°, page 667.

B: Dilute the combined filtrate and washings from *Test A* to 50 cc., cool in ice water, and filter. Evaporate 40 cc. of the filtrate to a syrupy consistency. Add 5 cc. of absolute alcohol, neutralize with normal sodium hydroxide, filter, and dilute to 10 cc. with absolute alcohol. Add 1 Gm. of trinitrophenol, heat to boiling and cool in ice water. Collect the crystals on a filter, recrystallize from alcohol, and dry over sulfuric acid in a vacuum: the crystals melt between 108° and 110°, page 667.

Residue on ignition—A 5-cc. portion of Iodopyracet Injection, after evaporation to dryness on a steam bath, yields not more than 5 mg. of residue on ignition, page 685.

Inorganic iodides—To 10 cc. of the filtrate from *Identification test B* add 1 cc. of chloroform and 2 drops of ferric chloride T.S., and shake: no coloration is imparted to the chloroform layer.

Iodine assay of the 3,5-diiodo-4-pyridone-N-acetic acid—Accurately weigh about 200 mg. of the dried 3,5-diiodo-4-pyridone-N-acetic acid, obtained in *Identification test A*, into a 500-cc. Erlenmeyer flask, and add 15 cc. of sodium hydroxide T.S. Warm gently, and when completely dissolved add 25 cc. of a solution of potassium permanganate (1 in 15). Add several glass beads, place a small funnel in the flask, and boil gently for 10 minutes. Allow to cool, wash the funnel and flask with 75 cc. of water, and add 10 cc. of sulfuric acid (1 in 2). Add, in one portion, 15 cc. of a solution of sodium bisulfite (1 in 5), and, when the solution has become colorless, cool, and add the solution of potassium permanganate, dropwise, until a yellow color appears. At once add the solution of sodium bisulfite, dropwise, until the yellow color is again discharged. Add, dropwise, dilute potassium permanganate T.S., until a faint yellow color appears. Add starch T.S., and titrate with tenth-normal silver nitrate until the blue color is just discharged, leaving a canary yellow precipitate. Each cc. of tenth-normal silver nitrate is equivalent to 12.69 mg. of iodine (I).

Assay for iodopyracet—Transfer exactly 5 cc. of Iodopyracet Injection, obtained from the *Determination of Volume of Injection in Containers*, page 665, to a 50-cc. volumetric flask, add water to make 50 cc., and mix. Place 10 cc. of the diluted solution in a beaker, heat gently to boiling, and add exactly 12 cc. of approximately tenth-normal silver nitrate. Stir until the precipitate becomes granular, cool the beaker in ice for 30 minutes, with occasional stirring. Filter through a tared Gooch crucible, using the cold filtrate to rinse the beaker, wash the precipitate, dropwise, with 5 cc. of ice-cold water, and dry to constant weight at 110°. The weight, multiplied by 0.9961, is the weight of the iodopyracet present in 1 cc. of Iodopyracet Injection.

Packaging and storage—Preserve Iodopyracet Injection preferably in hermetic containers or in other suitable containers. See *Containers for Injections*, page 630.

Ipecac

IPECAC

Ipecacuanha

Ipecac.—Ipecacuanhæ radix P.I.

Ipecac consists of the dried rhizome and roots of *Cephaëlis Ipecacuanha* (Brotero) A. Richard, known in commerce as Rio or Brazilian Ipecac, or of *Cephaëlis acuminata* Karsten, known in commerce as Cartagena, Nicaragua, or Panama Ipecac (Fam. *Rubiaceæ*).

Ipecac yields not less than 2 per cent of the ether-soluble alkaloids of Ipecac.

Description—

Unground Rio Ipecac—Roots in cylindrical pieces, mostly curved and sharply flexuous, occasionally branched, from 3 to 15 cm. in length, from 1 to 4 mm. in diameter, reddish brown to dark brown, either smooth or closely annulated, with thickened, incomplete rings and usually exhibiting transverse fissures with vertical sides; bark of smooth root thin, approximately one-ninth of the diameter of the root, that of the annulated root approximately two-thirds of the entire diameter; fracture of bark short, easily separable from the tough, fibrous wood; odor distinctive, the dust sternutatory; taste bitter, nauseous, and acrid. Rhizomes cylindrical, attaining a length of 10 cm. and a thickness of 2 mm., finely longitudinally wrinkled, with a few elliptical scars and a distinct pith approximately one-sixth of the entire diameter of the rhizome.

Histology of Rio Ipecac—Outer layer brown to yellowish orange, consisting of several layers of cork cells, some showing distinct granular masses covering the tangential walls; cortex consisting chiefly of parenchyma cells filled with starch grains, a few containing raphides of calcium oxalate; wood, yellowish, consisting of characteristic tracheæ and tracheids with bordered or slit-like pores, modified medullary rays of prosenchymatous cells containing starch grains, the latter up to 15 microns in diameter, and a few lignified fibers with oblique slit-like pores and more or less attenuated ends; rhizome differing from the root mainly by exhibiting a central pith and a narrower wood.

Unground Cartagena Ipecac—As compared with Rio Ipecac, up to 6.5 mm. in diameter; externally grayish, grayish brown or reddish brown, the reddish brown variety frequently beset with numerous transverse ridges bearing light-colored abrasions; annulations less numerous; simple starch grains, on the average, larger in the medullary rays of the wood.

Powdered Ipecac—Pale brown, weak yellow or light olive gray. Elements of identification: the cork cells; the starch grains simple or 2- to 8-compound, the simple grains up to 15 microns in diameter (Rio Ipecac) and up to 20 microns in diameter (Cartagena Ipecac); raphides of calcium oxalate up to 56 microns in length and fragments of the porous tracheids and tracheæ.

Overground stems—The amount of overground stems of ipecac in Ipecac does not exceed 5 per cent.

Foreign organic matter—The amount of *Foreign organic matter* in Ipecac does not exceed 2 per cent, pages 710 and 711.

Assay—Place 10 Gm. of Ipecac, in fine powder, in a dry, 250-cc. flask. Add 100 cc. of peroxide-free ether, measured at 25°, stopper the flask tightly, shake the mixture thoroughly, and allow it to stand for 5 minutes. Then add 10 cc. of ammonia T.S., stopper the flask tightly, shake it for 1 hour in a mechanical shaker, or intermittently during 2 hours, and allow to stand over night at a temperature not exceeding 25°. Again shake the mixture intermittently during 30 minutes, and allow the drug to settle at 25°. Quickly transfer to a separator exactly 50 cc. of the clear, supernatant liquid, representing 5 Gm. of Ipecac, rinse the measuring vessel with a small volume of peroxide-free ether, and add the rinsing to the solution in the separator. Completely extract the alkaloids from the ether with approximately normal sulfuric acid, preferably using 15 cc. the first time, or sufficient to insure an acid reaction, and 10 cc. for each succeeding extraction, and filtering all extractions through the same filter into a second separator (see *Purification of the Alkaloids*, 676 and 677). To the combined acid solutions add about an equal volume of peroxide-free ether, render the mixture alkaline with ammonia T.S., and completely extract with successive portions of peroxide-free ether. Filter each portion of the ether extract into a flask or beaker, and carefully evaporate the combined ether extracts on a steam bath until nearly but not quite dry. Add 5 cc. of peroxide-free ether and exactly 10 cc. of tenth-normal sulfuric acid, and heat on a steam bath to effect complete solution of the alkaloid and to remove all of the ether. Cool, dilute with 15 cc. of water, and titrate the excess of acid with tenth-

normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 24.0 mg. of the ether-soluble alkaloids of ipecac.

AVERAGE DOSE—Emetic, **0.5 Gm.** (approximately 7½ grains).

IPECAC FLUIDEXTRACT

Fluidextractum Ipecacuanhæ

Fldext. Ipecac.

Ipecac Fluidextract yields, from each 100 cc., not less than 1.8 Gm. and not more than 2.2 Gm. of the ether-soluble alkaloids of ipecac.

IPECAC, in fine powder............................ 1000 Gm.

Exhaust the ipecac by percolation, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum, macerating for 72 hours, and percolating slowly. Reduce the entire percolate to a volume of 1000 cc. by evaporation at a temperature not exceeding 60°, and add 2000 cc. of water. Allow the mixture to stand over night, filter, and evaporate the filtrate to a volume of 565 cc. To this add 35 cc. of hydrochloric acid and 300 cc. of alcohol, mix well, and filter.

Assay a portion of this liquid, and dilute the remainder with a mixture of 30 volumes of alcohol, 3.5 volumes of hydrochloric acid, and 66.5 volumes of water to make each 100 cc. of the Fluidextract contain 2.0 Gm. of the ether-soluble alkaloids of ipecac.

Assay—Measure accurately 10 cc. of Ipecac Fluidextract, and transfer it to an evaporating dish containing either absorbent paper or asbestos, and dry at a temperature not exceeding 60°. Transfer the absorbent to a flask containing 100 cc. of peroxide-free ether, measured at 25°, stopper the flask tightly, shake well, and allow the mixture to stand for 5 minutes. Then add 10 cc. of ammonia T.S., using a portion of the ammonia T.S. to rinse traces of the absorbent from the evaporating dish. Stopper the flask tightly, shake it for 1 hour in a mechanical shaker, or intermittently during 2 hours, and allow it to stand over night at a temperature not exceeding 25°. Again shake the mixture intermittently during 30 minutes, and allow the absorbent to settle at 25°. Then quickly transfer to a separator exactly 50 cc. of the clear supernatant liquid, representing 5 cc. of the Fluidextract and proceed as directed under the *Assay* for *Ipecac*, page 277, beginning with the words "rinse the measuring vessel with a small volume of peroxide-free ether." Each cc. of tenth-normal sulfuric acid is equivalent to 24.0 mg. of the ether-soluble alkaloids of ipecac.

Alcohol content—From 28 to 33 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Ipecac Fluidextract in tight, light-resistant containers, and avoid exposure to excessive heat.

AVERAGE DOSE—Emetic, **0.5 cc.** (approximately 8 minims).

Ipecac Syrup

IPECAC SYRUP

Syrupus Ipecacuanhæ

Syr. Ipecac.

IPECAC FLUIDEXTRACT	70 cc.
GLYCERIN	100 cc.
SYRUP, a sufficient quantity,	
To make	1000 cc.

Mix the fluidextract with the glycerin, and add enough syrup to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 1 to 2.5 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Ipecac Syrup in tight containers, preferably at a temperature not above 25°.

AVERAGE DOSE—Emetic, 8 cc. (approximately 2 fluidrachms).

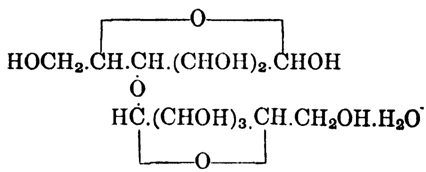
	PAGE
Isotonic Sodium Chloride Solution	490
Juniper Tar	554
Lactated Ringer's Solution	455

Lactose

LACTOSE

Lactosum

Lactos.—Saccharum Lactis, Milk Sugar



$C_{12}H_{22}O_{11}.H_2O$ **Mol. wt. 360.31**

Lactose is a sugar obtained from milk.

Description—Lactose occurs as white, hard, crystalline masses or as a white powder. It is odorless, and has a faintly sweet taste. It is stable in air, but readily absorbs odors. Its solutions are neutral to litmus paper.

Solubility—One Gm. of Lactose dissolves in 5 cc. of water, and in 2.6 cc. of boiling water. Lactose is very slightly soluble in alcohol and is insoluble in chloroform and in ether.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Lactose is not less than +52.2° and not more than +52.5° when determined in a solution containing 10 Gm. of Lactose previously dried to constant weight at 80° and 0.2 cc. of ammonia T.S. in each 100 cc. and using a 200-mm. tube, page 675.

Identification—Add 5 cc. of sodium hydroxide T.S. to 5 cc. of a hot, saturated, solution of Lactose, and gently warm the mixture: the liquid becomes yellow and

finally brownish red. On the subsequent addition of a few drops of cupric sulfate T.S., a red precipitate of cuprous oxide forms.

Residue on ignition—Lactose yields not more than 0.1 per cent of residue on ignition, page 685.

Heavy metals—Dissolve 3 Gm. of Lactose in 20 cc. of warm water, add 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with water. The heavy metals limit, page 657, for Lactose is 5 parts per million.

Dextrose—Add 25 cc. of 70 per cent alcohol (by volume) to 5 Gm. of Lactose, reduced to at least a No. 100 powder. Shake the mixture frequently during 30 minutes, and filter through a dry filter having a diameter of from 5 to 7 cm. Evaporate 5 cc. of the filtrate to dryness on a water bath, and dissolve the residue in 5 cc. of water. Transfer the solution to a test tube, filtering if necessary, and add 5 cc. of stronger cupric acetate T.S. Immerse the test tube in boiling water or in actively flowing steam for 3 minutes, and allow to stand at room temperature for 25 minutes: no red precipitate appears in the mixture.

Sucrose—Evaporate to dryness on a water bath a 10-cc. portion of the alcoholic solution prepared for the preceding test, dissolve the residue in 9 cc. of water, and add 1 cc. of 25 per cent hydrochloric acid (made by mixing 20 cc. of hydrochloric acid with 8 cc. of water) and 100 mg. of resorcinol. Transfer the mixture to a thin-walled test tube of from 16- to 19-mm. internal diameter, and immerse the test tube in boiling water or actively flowing steam for 8 minutes: the liquid remains colorless or assumes only a slight, yellow color.

Starch or dextrin—Dissolve 1 Gm. of Lactose in 10 cc. of water, boil for 1 minute, cool to room temperature, and add 1 drop of iodine solution (made by diluting 1 volume of iodine T.S. with 4 volumes of water): the mixture assumes no red, violet, or blue color.

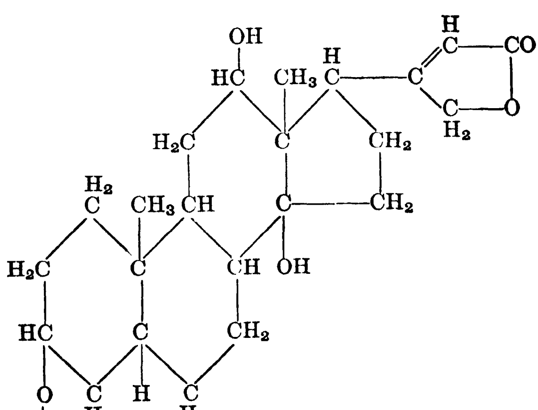
Clarity and color of solution—A solution of 3 Gm. of Lactose in 10 cc. of boiling water is clear, colorless, and odorless.

Packaging and storage—Preserve Lactose in well-closed containers.

Lanatoside C

LANATOSIDE C

Lanatosidum C



(Digitoxose)$_3$-glucose-acetyl, less $4H_2O$

$C_{49}H_{76}O_{20}$ Mol. wt. 984.58

Lanatoside C is a glycoside obtained from the leaves of *Digitalis lanata* Ehrh. (Fam. *Scrophulariaceæ*). Lanatoside C is hygroscopic, rapidly absorbing about 7 per cent of moisture when exposed to air.

Description—Lanatoside C occurs as colorless or white crystals or as a white crystalline powder. It is odorless. It melts indistinctly, and with decomposition, at about 250°.

Solubility.—Lanatoside C is insoluble in water; it is sparingly soluble in alcohol, but soluble in dioxane and pyridine. One Gm. of it dissolves in about 20 cc. of methanol and in about 2000 cc. of chloroform. It is practically insoluble in ether and in petroleum benzin.

Specific rotation—The specific rotation, $[\alpha_D^{20}]$, of Lanatoside C, determined in an alcohol solution containing the equivalent of 200 mg. of dried Lanatoside C in 10 cc. of the solution, and using a 100-mm. tube, is not less than +33.4° and not more than +33.7°, page 675.

Identification—Add 0.5 cc. of ferric chloride T.S. to 100 cc. of glacial acetic acid, and mix well. Dissolve 2 to 3 mg. of Lanatoside C in 5 cc. of this solution, and underlay with 5 cc. of sulfuric acid: an intense indigo-blue color is immediately formed in the acetic acid layer, and a brown ring, free from red, is produced at the junction of the two liquids.

Loss on Drying—When dried in a vacuum over sulfuric acid to constant weight, Lanatoside C loses not more than 7.5 per cent of its weight.

Residue on ignition—The residue on ignition from 100 mg. of Lanatoside C is negligible.

Packaging and storage—Preserve Lanatoside C in light-resistant containers.

Average dose—Oral, **0.5 mg.** (approximately 1/120 grain). Parenteral, to be determined by the physician according to the needs of the patient.

Lanatoside C Injection

LANATOSIDE C INJECTION

Injectio Lanatosidi C

Inj. Lanatosid. C

Lanatoside C Injection is a sterile solution of lanatoside C in 10 per cent, by volume, of alcohol. Glycerin may also be present. The Injection contains, in each cc., the labeled amount of lanatoside C. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Lanatoside C Injection preferably by Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Assay—Prepare a *Standard preparation of lanatoside C* by dissolving U. S. P. Lanatoside C Reference Standard in sufficient 70 per cent alcohol to make a 1 to 1000

solution with an accuracy within 1 per cent. Preserve this stock solution in a cold place, in a tight glass container, and do not use it for assays after a period of more than 6 months.

Use the Injection as the *preparation to be assayed*, and proceed as directed under the *Assay* of *Digitalis Tincture*, page 173, beginning with the second paragraph, and substituting the *Standard preparation of lanatoside C* for the *Standard preparation of digitalis*, deleting the sentence beginning "Express the potency. . . ," and do not use the *test dilutions* after a period of more than 3 hours. Lanatoside C Injection is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from the labeled potency.

Packaging and storage—Preserve Lanatoside C Injection in single dose, hermetic containers. Protect from light.

Sizes—Lanatoside C Injection usually available contains the following amounts of lanatoside C: 0.4 mg. ($1/150$ grain) in 2 cc.; 0.8 mg. ($1/80$ grain) in 4 cc.

AVERAGE DOSE OF LANATOSIDE C—To be determined by the physician according to the needs of the patient.

Lanatoside C Tablets

LANATOSIDE C TABLETS

Tabellæ Lanatosidi C

Tab. Lanatosid. C

Lanatoside C Tablets contain the labeled amount of lanatoside C.

Assay—Triturate a counted number of not less than 20 Lanatoside C Tablets in a glass mortar, with the aid of a sufficient amount of 70 per cent alcohol, until the Tablets have completely disintegrated. Transfer the mixture completely, with the aid of 70 per cent alcohol, to a hard-glass, glass-stoppered, centrifuge tube, and add sufficient 70 per cent alcohol, so that the total volume of 70 per cent alcohol corresponds to 5 cc. for each expected milligram of lanatoside C. Shake the mixture continuously for 2 hours at 25° ± 5° in a mechanical shaker, centrifuge, use the supernatant, clear liquid as the *preparation to be assayed*, and proceed as directed under the *Assay of Lanatoside C Injection*, page 282. Lanatoside C Tablets are considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 25 per cent from the labeled potency.

Packaging and storage—Preserve Lanatoside C Tablets in well-closed containers.

Sizes—Lanatoside C Tablets usually available contain the following amount of lanatoside C: 0.5 mg. ($1/120$ grain).

AVERAGE DOSE OF LANATOSIDE C—Oral, **0.5 mg.** (approximately $1/120$ grain).

Lard

LARD

Adeps

Lard is the purified internal fat of the abdomen of the hog, *Sus scrofa* Linné var. *domesticus* Gray (Fam. *Suidæ*).

Description—Lard is a white, soft, unctuous mass, having a faint odor and a bland taste, free from rancidity.

Solubility—Lard is insoluble in water, very slightly soluble in alcohol, and readily soluble in ether and in chloroform.

Melting range—Lard melts between 36° and 42°, forming a clear liquid from which no water layer separates.

Free alkali—Water boiled with Lard shows no alkaline reaction to litmus paper.

Chloride—Boil 1 Gm. of Lard with 20 cc. of alcohol under a reflux condenser for 10 minutes, cool, filter, and add to the filtrate 5 drops of an alcohol solution of silver nitrate (1 in 50): the mixture is no more turbid than a mixture of the same volumes of the same reagents with 0.5 cc. of fiftieth-normal hydrochloric acid.

Beef stearin—Dissolve 5 Gm. of Lard in 20 cc. of ether in a test tube, close the tube loosely with purified cotton, and allow it to stand for about 18 hours at a temperature of about 20°. Collect some of the crystals which have separated at the bottom of the test tube, mount them either in alcohol or in a fixed oil, and examine them under a microscope having a magnifying power of about 200 diameters: the stearin from the Lard crystallizes in the form of flat, rhomboidal plates, terminating obliquely at one end and grouped irregularly, while beef stearin crystallizes in the form of cylindrical rods or needles with sharp ends and grouped in fan-shaped clusters.

Cottonseed fats—Agitate in a test tube 5 cc. of melted and filtered Lard, while warm, with 5 cc. of an alcohol solution of silver nitrate (made by dissolving 100 mg. of silver nitrate in 10 cc. of alcohol and adding 2 drops of nitric acid), and heat this mixture for 5 minutes in a bath of boiling water: the liquid fat acquires no reddish or brown color, nor is any dark color produced at the zone of contact of the hot liquids.

Free fatty acids—The free acids in 10 Gm. of Lard require for neutralization not more than 2 cc. of tenth-normal sodium hydroxide, page 646.

Iodine value—Lard has an iodine value of not less than 46 and not more than 70, page 647.

Saponification value—Lard has a saponification value of not less than 195 and not more than 203, page 647.

Solidification range of fatty acids—The mixed fatty acids obtained from Lard solidify at a temperature not below 36° and not above 42°, page 645.

Packaging and storage—Preserve Lard in well-closed containers, preferably at a temperature not above 30°.

Lard, Benzoinated

BENZOINATED LARD

Adeps Benzoinatus

Adeps Benz.

LARD....................................	1000 Gm.
SIAM BENZOIN, in coarse powder..................	10 Gm.
To make about....................	1000 Gm

Thoroughly mix the benzoin with the lard previously melted on a water bath, cover the container, and keep the mixture at a temperature near, but at no time above, 60° for 2 hours. Strain the liquid through muslin, and stir it occasionally while it cools.

In the preparation of Benzoinated Lard for use in southern latitudes and during the warm season in other localities, 50 Gm. (or more if necessary) of the lard may be replaced with an equal weight of white wax. If wax is added, it must first be melted, then the melted lard added and the mixture stirred until it congeals.

Packaging and storage—Preserve Benzoinated Lard in well-closed containers, preferably at a temperature not above 30°.

LAVENDER OIL

Oleum Lavandulæ

Ol. Lavand.—Lavender Flowers Oil

Lavender Oil is the volatile oil distilled with steam from the fresh flowering tops of *Lavandula officinalis* Chaix ex Villars (*Lavandula vera* DeCandolle) (Fam. *Labiatæ*). It contains not less than 30 per cent of esters calculated as linalyl acetate ($C_{10}H_{17}.C_2H_3O_2$).

Description—Lavender Oil is a colorless or yellow liquid, having the characteristic odor and taste of lavender flowers.

Solubility—Lavender Oil is soluble in 4 volumes of 70 per cent alcohol.

Specific gravity—The specific gravity of Lavender Oil is not less than 0.875 and not more than 0.888.

Optical rotation—The optical rotation of Lavender Oil is not less than $-3°$ and not more than $-10°$ in a 100-mm. tube, page 675.

Refractive index—The refractive index of Lavender Oil is not less than 1.4590 and not more than 1.4700 at 20°, page 682.

Alcohol—Shake 5 cc. of Lavender Oil with an equal volume of water in a narrow, graduated, 10-cc. glass-stoppered cylinder: the volume of the oil does not diminish.

Foreign water soluble esters—Shake 20 cc. of Lavender Oil with 40 cc. of 5 per cent alcohol in a 100-cc., glass-stoppered cylinder. When the mixture has cleared, withdraw 30 cc. of the alcohol solution, by means of a pipette, and place it in a 125-cc. Erlenmeyer flask. Neutralize the solution with half-normal potassium hydroxide, using 2 drops of phenolphthalein T.S. as the indicator, add exactly 5 cc. of half-normal potassium hydroxide, and heat the mixture on a bath of boiling water under a reflux condenser during 1 hour. Allow the mixture to cool, remove the flask from the bath, and titrate the excess of alkali with half-normal hydrochloric acid: not less than 4.7 cc. of the acid is required for neutralization.

Assay—Proceed as directed in the *Assay for esters* under *Peppermint Oil*, page 390, using 5 cc. of Lavender Oil, accurately weighed, and 50 cc. of half-normal alcoholic potassium hydroxide. The number of cc. of half-normal alcoholic potassium hydroxide consumed in the saponification, multiplied by 0.09814, indicates the number of Gm. of esters, calculated as linalyl acetate, $C_{10}H_{17}.C_2H_3O_2$, in the weight of the Oil taken for assay.

Packaging and storage—Preserve Lavender Oil in tight containers.

.avender Spirit

LAVENDER SPIRIT

Spiritus Lavandulæ

Sp. Lavand.

Lavender Spirit contains, in each 100 cc., not less than 4 cc. and not more than 6 cc. of lavender oil.

Lavender Oil	50 cc.
Alcohol, a sufficient quantity,	
To make	1000 cc.

Mix the oil with sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 10 cc. of Lavender Spirit to a Babcock bottle, graduated to 8 per cent, add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Then add sufficient saturated calcium chloride solution, acidified with hydrochloric acid, almost to fill the bulb of the bottle. Rotate the bottle vigorously to insure thorough mixing, then add a sufficient quantity of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and then read the volume of the oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 2.2 to obtain the volume of oil in 100 cc. of the Spirit.

Packaging and storage—Preserve Lavender Spirit in tight containers, protected from light.

Alcohol content—From 85 to 92 per cent, by volume, of C_2H_5OH.

vender Tincture, Compound

COMPOUND LAVENDER TINCTURE

Tinctura Lavandulæ Composita

Tr. Lavand. Co.—Compound Lavender Spirit

Lavender Oil	8 cc.
Rosemary Oil	2 cc.
Cinnamon, in moderately coarse powder	20 Gm.
Clove, in moderately coarse powder	5 Gm.
Myristica, in moderately coarse powder	10 Gm.
Red Saunders, in moderately coarse powder	10 Gm.
To make	1000 cc.

Prepare a tincture by Process M, page 708, macerating the mixed powders in a mixture of 750 cc. of alcohol, in which the oils have been dissolved, and 250 cc. of water. Complete the preparation with a menstruum of 3 volumes of alcohol and 1 volume of water.

Packaging and storage—Preserve Compound Lavender Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 67 to 72 per cent, by volume, of C_2H_5OH.

LEAD ACETATE

Plumbi Acetas

Plumb. Acet.—Sugar of Lead

$Pb(C_2H_3O_2)_2.3H_2O$ Mol. wt. 379.35

Lead Acetate contains not less than 85.3 per cent and not more than 89.6 per cent of $Pb(C_2H_3O_2)_2$, corresponding to not less than 99.5 per cent of the hydrated salt $Pb(C_2H_3O_2)_2.3H_2O$.

Description—Lead Acetate occurs as colorless, shining, transparent prisms or plates, as heavy, white, crystalline masses, or as granular crystals. It has a faintly acetous odor, is efflorescent, and absorbs carbon dioxide on exposure to air, becoming incompletely soluble in water. Its solutions are slightly alkaline to litmus paper.
Solubility—One Gm. of Lead Acetate dissolves in 1.6 cc. of water and in about 30 cc. of alcohol. One Gm. of it dissolves in 0.5 cc. of boiling water. It is freely soluble in glycerin.
Identification—A solution of Lead Acetate (1 in 10) responds to the tests for *Lead*, page 661, and for *Acetate*, page 658.
Carbonate—A solution of Lead Acetate (1 in 10) prepared with recently boiled water, and containing 0.05 cc. of glacial acetic acid for each 10 cc. of solution, is clear, or not more than slightly turbid.
Alkalies and earths—Dissolve 2 Gm. of Lead Acetate in a mixture of 100 cc. of water and 1 cc. of glacial acetic acid, and pass hydrogen sulfide through the solution until all of the lead is precipitated. Filter, add 5 drops of sulfuric acid to 50 cc. of the filtrate, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 5 mg.
Iron or copper—A solution of Lead Acetate (1 in 10) yields with potassium ferrocyanide T.S. a precipitate which is neither blue nor red.
Assay—Weigh accurately about 1.5 Gm. of Lead Acetate, and dissolve it in 5 cc. of glacial acetic acid and sufficient water to make exactly 100 cc. of solution. Transfer exactly 25 cc. of this solution to a 200-cc. volumetric flask, dilute with 50 cc. of water, heat to boiling, and add exactly 50 cc. of tenth-normal potassium dichromate. Heat on a steam bath, with frequent shaking, for 10 minutes, then cool, dilute with water to 200 cc., mix well, and allow the precipitate to settle. Filter the mixture through a filter that has not been previously moistened, rejecting the first 20 cc. of the filtrate, and transfer exactly 100 cc. of the subsequent filtrate to a glass-stoppered flask. Then add 10 cc. of diluted sulfuric acid and 1 Gm. of potassium iodide, mix thoroughly, allow to stand for 10 minutes, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding 2 cc. of starch T.S. near the end of the titration. Each cc. of tenth-normal potassium dichromate is equivalent to 10.84 mg. of $Pb(C_2H_3O_2)_2$.
Packaging and storage—Preserve Lead Acetate in tight containers.

Lemon Oil

LEMON OIL

Oleum Limonis

Ol. Limon.

Lemon Oil is the volatile oil obtained by expression, without the aid of heat, from the fresh peel of the fruit of *Citrus Limon* (Linné) Burmann filius (Fam. *Rutaceæ*), with or without the previous separation of the pulp and the peel.

Note—Lemon Oil which has a terebinthinate odor must not be used nor dispensed.

Description—Lemon Oil is a pale yellow to deep yellow or greenish yellow liquid, having the characteristic odor and taste of the outer part of fresh lemon peel.

Solubility—Lemon Oil is soluble in 3 volumes of alcohol, and in all proportions in dehydrated alcohol, in carbon disulfide, and in glacial acetic acid.

Specific gravity—The specific gravity of Lemon Oil is not less than 0.849 and not more than 0.855.

Optical rotation—The optical rotation of Lemon Oil is not less than +57° and not more than +65.6° in a 100-mm. tube, page 675.

Refractive index—The refractive index of Lemon Oil is not less than 1.4740 and not more than 1.4755 at 20°, page 682.

Reaction—A solution of recently expressed Lemon Oil in alcohol (1 in 3) is neutral or only slightly acid to moistened litmus paper.

Foreign oils—When distilled as described under *Orange Oil*, page 365, Lemon Oil gives the following results: the angle of optical rotation of the first 5 cc. is not more than 6° less than that of the original Oil. The refractive index of this same portion is not less than 0.0010 and not more than 0.0027 lower than that of the original Oil.

Packaging and storage—Preserve Lemon Oil in well-filled, tight containers and avoid exposure to excessive heat.

Lemon Peel

LEMON PEEL

Limonis Cortex

Limon. Cort.

Lemon Peel is the outer yellow rind of the fresh ripe fruit of *Citrus Limon* (Linné) Burmann filius (Fam. *Rutaceæ*).

Description—The outer lemon yellow or dark yellow layer, separated from the fresh fruit by grating or paring; consisting of the epidermis and numerous parenchyma cells, some containing yellow chromoplastids and a few membrane crystals of calcium oxalate; large oil reservoirs with globules of the volatile oil; odor fragrant, distinctive; taste aromatic.

LEMON TINCTURE

Tinctura Limonis

Tr. Limon.—Lemon Peel Tincture

LEMON PEEL, the outer yellow rind grated or pared from the fresh fruit	500 Gm.
To make	1000 cc.

Prepare a tincture by Process M, page 708, macerating the drug in 900 cc. of alcohol and completing the preparation with alcohol. Use purified cotton or talc as the filtering medium.

Packaging and storage—Preserve Lemon Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 70 to 75 per cent, by volume, of C_2H_5OH

LIVER EXTRACT

Extractum Hepatis

Ext. Hepat.—Dry Liver Extract

Liver Extract is a dry, brownish, somewhat hygroscopic powder, and contains that soluble thermostable fraction of mammalian livers which increases the number of red blood corpuscles in the blood of persons affected with pernicious anemia. The approximate anti-anemia potency of Liver Extract in pernicious anemia is expressed in U. S. P. Units (oral). The Extract conforms to all other requirements outlined under *Anti-anemia Preparations*, page 617.

Packaging and storage—Preserve Liver Extract in tight or in hermetic containers, preferably at a temperature not above 20°.
Labeling—Label Liver Extract to show the potency assigned to it by the U. S. P. Anti-anemia Preparations Advisory Board.

AVERAGE DAILY DOSE—One U. S. P. Unit.

Liver Injection

LIVER INJECTION

Injectio Hepatis

Inj. Hepat.—Liver Extract for Parenteral Use

Liver Injection is a sterile solution in water for injection of that soluble thermostable fraction of mammalian livers which increases the number of red blood corpuscles in the blood of persons affected with pernicious anemia. The approximate anti-anemia potency of Liver Injection upon intramuscular administration in pernicious anemia is expressed in U. S. P. Units (Injectable). Liver Injection contains not more than 15 U. S. P. Units (Injectable) in each cc. Liver Injection conforms to all other requirements outlined under *Anti-anemia Preparations*, page 617. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Liver Injection preferably by Process F. See *Sterilization Processes*, page 692.

Liver Injection contains not more than 0.5 per cent of cresol or of phenol if either is used as a bacteriostatic agent.

Liver Injection also conforms to the other requirements under *Injections*, page 664, except that at times it may show signs of a slight turbidity or precipitate.

Packaging and storage—Preserve Liver Injection preferably in single-dose hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630. Preserve the Injection preferably at a temperature not above 20° and protected from light.
Labeling—Label Liver Injection to show the potency assigned to it by the U. S. P Anti-anemia Preparations Advisory Board. Liver Injection, when developed by stopping the processes of extraction at such a stage that the final product is derived directly from an alcohol solution of a concentration not higher than 70 per cent, by volume, of C_2H_5OH, may be labeled as *Liver Injection (Crude)*. Liver Injection (Crude) contains not more than 2 U. S. P. units (Injectable) in each cc.
Sizes—Liver Injection usually available contains the following U. S. P. Units: 2, 5, 10, and 15 U. S. P. units (Injectable) in 1 cc.
Liver Injection (Crude) is usually available containing the following U. S. P units: 1 and 2 U. S. P. units (Injectable) in 1 cc.

AVERAGE DAILY DOSE—Intramuscular, 1 U. S. P. Unit.

LIVER SOLUTION

Liquor Hepatis

Liq. Hepat.—Liquid Liver Extract

Liver Solution is a brownish liquid, and contains that soluble thermostable fraction of mammalian livers which increases the number of red blood corpuscles in the blood of persons affected with pernicious anemia. The approximate anti-anemia potency of Liver Solution in pernicious anemia is expressed in U. S. P. Units (oral). The Solution conforms to all other requirements outlined under *Anti-anemia Preparations*, page 617.

NOTE—If desired, a suitable flavor may be added to Liver Solution.

Preservation—Liver Solution must be suitably preserved. If alcohol is used, the amount must not exceed 25 per cent, by volume; if glycerin is used, not more than 40 per cent, by volume.

Packaging and storage—Preserve Liver Solution in tight, light-resistant containers, preferably at a temperature not above 20°.

Labeling—Label Liver Solution to show the potency assigned to it by the U. S. P. Anti-anemia Preparations Advisory Board and the name and proportion of the preservative contained in it.

AVERAGE DAILY DOSE—One U. S. P. Unit.

LIVER WITH STOMACH

Hepar cum Stomacho

Hepar c. Stomach.

Liver with Stomach is a brownish powder resulting from mixing a concentrated water solution of mammalian liver with minced fresh hog stomach tissue. The fraction of liver employed is soluble in approximately 70 per cent alcohol, by volume, and insoluble in approximately 95 per cent alcohol, by volume. After admixture and incubation, the product is dried under reduced pressure, and defatted.

The approximate anti-anemia potency of Liver with Stomach in pernicious anemia is expressed in U. S. P. Units (oral). Liver with Stomach conforms to all other requirements outlined under *Anti-anemia Preparations*, page 617. This preparation is not regarded as a mixture because the potentiating interaction of the liver extract and stomach tissue produces, in pernicious anemia, an effect indistinguishable from that of larger amounts of either liver extract or stomach alone. The activity

of the preparation other than that of the liver fraction contained is readily destroyed when the preparation is suspended in a hot liquid.

Packaging and storage—Preserve Liver with Stomach in well-closed containers, preferably in a cool place.
Labeling—Label Liver with Stomach to show the potency assigned to it by the U. S. P. Anti-anemia Preparations Advisory Board.

AVERAGE DAILY DOSE—1 U. S. P. unit.

Lotions

Magmas

Magnesia Magma

MAGNESIA MAGMA

Magma Magnesiæ

Magma Mag.—Milk of Magnesia

Magnesia Magma is a suspension of magnesium hydroxide containing not less than 7 per cent and not more than 8.5 per cent of $Mg(OH)_2$.

NOTE—To minimize the action of the glass container on Magnesia Magma, 0.1 per cent of citric acid may be added. Not more than one-half cc. of a volatile oil or a blend of volatile oils, suitable for flavoring purposes, may be added to each 1000 cc. of Magnesia Magma.

Description—Magnesia Magma is a white, opaque, more or less viscous suspension from which varying proportions of water usually separate on standing. It is alkaline to litmus and to phenolphthalein T.S.
Identification—A solution of 1 cc. of Magnesia Magma in 2 cc. of diluted hydrochloric acid responds to the tests for *Magnesium*, page 661.
Soluble alkalies—Transfer about 25 cc. of Magnesia Magma to a filter, and reject the first 5 cc. of filtrate. Dilute 5 cc. of the clear filtrate with 40 cc. of water. Add 1 drop of methyl red T.S., and titrate the solution with tenth-normal sulfuric acid to the production of a persistent pink color: not more than 0.4 cc. of the acid is required.
Soluble salts—To 5 cc. of the clear filtrate obtained in the test for *Soluble alkalies* add 3 drops of sulfuric acid, and evaporate to dryness on a water bath: the weight of residue after gentle ignition to constant weight does not exceed 8 mg.
Carbonate and acid insoluble matter—The addition of 2 cc. of diluted hydrochloric acid to 1 cc. of Magnesia Magma causes not more than a slight effervescence, and the resulting solution is not more than slightly turbid.
Arsenic—To 5 cc. of Magnesia Magma add sufficient diluted sulfuric acid to dissolve

the magnesium hydroxide. One-half of this solution, representing 2.5 cc. of Magnesia Magma, meets the requirements of the test for *Arsenic*, page 618 (0.8 part per million).

Calcium—Add, in small portions, 25 cc. of a mixture of 5 cc. of sulfuric acid and 25 cc. of water to 10 cc. of Magnesia Magma. Allow to cool, add 70 cc. of alcohol, and allow the mixture to stand over night. If crystals of magnesium sulfate have separated, warm the mixture to about 50° to dissolve them. Filter through a Gooch crucible containing an asbestos mat which has been washed previously with diluted sulfuric acid, water, and alcohol, and ignited. Wash the crystals on the mat several times with a mixture of 2 volumes of alcohol and 1 volume of diluted sulfuric acid. Dry, and ignite the crucible and contents at a dull red heat to constant weight. The weight of the calcium sulfate so obtained does not exceed 26 mg.

Heavy metals—To 5 cc. of Magnesia Magma add 6 cc. of diluted hydrochloric acid, and evaporate the solution to dryness on a water bath, with frequent stirring. Dissolve the residue in 20 cc. of water, and filter. Add 2 cc. of diluted acetic acid to the filtrate, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Magnesia Magma is 5 parts per million.

Assay—After thorough agitation, place about 5 Gm. of Magnesia Magma in a tared flask, stopper, and weigh accurately, add 25 cc. of normal sulfuric acid, and, after solution is complete, titrate the excess of acid with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 29.17 mg. of $Mg(OH)_2$.

Packaging and storage—Preserve Magnesia Magma in tight containers, preferably at a temperature not above 35°. It should not be permitted to freeze.

AVERAGE DOSE—Antacid, 4 cc. (approximately 1 fluidrachm).
Laxative, 15 cc. (approximately 4 fluidrachms).

Magnesium Carbonate

MAGNESIUM CARBONATE

Magnesii Carbonas

Mag. Carb.

Magnesium Carbonate is a basic hydrated magnesium carbonate or a normal hydrated magnesium carbonate. It contains the equivalent of not less than 40 per cent and not more than 43.5 per cent of MgO.

Description—Magnesium Carbonate occurs in light, white, friable masses, or as a bulky, white powder. It is odorless, and is stable in air.

Solubility—Magnesium Carbonate is practically insoluble in water, to which, however, it imparts a slightly alkaline reaction. It is insoluble in alcohol, but is dissolved by dilute acids with effervescence.

Identification—When Magnesium Carbonate is treated with diluted hydrochloric acid, it dissolves with effervescence and the resulting solution responds to the tests for *Magnesium*, page 661.

Soluble salts—Mix 2 Gm. of Magnesium Carbonate with 100 cc. of a mixture of equal volumes of *n*-propyl alcohol and water. Heat the mixture to the boiling point, with constant stirring, cool to room temperature, dilute with water to 100 cc., and filter. Evaporate 50 cc. of the filtrate to dryness on a water bath, and dry at 120° for 3 hours: the weight of the residue does not exceed 10 mg.

Acid-insoluble substances—Mix 5 Gm. of Magnesium Carbonate with 75 cc. of water, and add hydrochloric acid in small portions at a time, with agitation, until no

more dissolves. If an insoluble residue remains, filter, wash well with water until the washings show no more chloride, then ignite: the weight of the ignited residue does not exceed 2.5 mg.

Arsenic—A solution of 400 mg. of Magnesium Carbonate in 5 cc. of diluted hydrochloric acid meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfurous and sulfuric acids (5 parts per million).

Calcium oxide—Dissolve about 1 Gm. of Magnesium Carbonate, accurately weighed, in a mixture of 3 cc. of sulfuric acid and 22 cc. of water. Add 50 cc. of alcohol, and allow the mixture to stand over night. If crystals of magnesium sulfate have separated, warm the mixture to about 50° to dissolve them. Filter through a Gooch crucible containing an asbestos mat which has been previously washed with diluted sulfuric acid, water, and alcohol, and ignited. Wash the crystals on the mat several times with a mixture of 2 volumes of alcohol and 1 volume of diluted sulfuric acid. Ignite the crucible and contents at a dull red heat, cool, and weigh. The weight of calcium sulfate thus obtained, multiplied by 0.4119, gives the equivalent of calcium oxide in the Magnesium Carbonate taken for the test; this should not exceed 0.6 per cent.

Heavy metals—Dissolve 1 Gm. of Magnesium Carbonate in 10 cc. of diluted hydrochloric acid, and evaporate the solution to dryness on a water bath. Toward the end of the evaporation, stir the residue frequently and disintegrate it so that finally a dry powder is obtained; dissolve the residue in 20 cc. of water, and filter. To the filtrate, which should be neutral to litmus paper, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Magnesium Carbonate is 30 parts per million.

Iron—Boil 100 mg. of Magnesium Carbonate with 5 cc. of a mixture of 1 volume of nitric acid and 9 volumes of water for 1 minute. Cool, dilute to 50 cc. with water, add 5 cc. of ammonium thiocyanate T.S., mix well, and transfer to a Nessler tube. Treat in the same manner exactly 2 cc. of a solution of ferric ammonium sulfate, made by dissolving 86.5 mg. of ferric ammonium sulfate in 10 cc. of diluted sulfuric acid and diluting it with water to make 1000 cc., each cc. representing 0.01 mg. of Fe. The color of the test solution is not deeper than that of the mixture containing the standard iron solution (0.02 per cent Fe). The comparison must be made within 5 minutes after the addition of the ammonium thiocyanate T.S.

Assay—Dissolve about 1 Gm. of Magnesium Carbonate, accurately weighed, in 30 cc. of normal sulfuric acid, and determine the residual acid by titrating with normal sodium hydroxide, using methyl orange T.S. as the indicator. From the volume of the normal sulfuric acid consumed deduct the volume of normal sulfuric acid corresponding to the content of calcium oxide in the weight of Magnesium Carbonate taken for the assay. The difference is the normal sulfuric acid equivalent to the magnesium oxide present. Each cc. of normal sulfuric acid is equivalent to 20.16 mg. of MgO or to 28.04 mg. of CaO.

Packaging and storage—Preserve Magnesium Carbonate in well-closed containers.

AVERAGE DOSE—Antacid, **0.6 Gm.** (approximately 10 grains).
Laxative, **8 Gm.** (approximately 2 drachms).

Magnesium Citrate Solution

MAGNESIUM CITRATE SOLUTION

Liquor Magnesii Citratis

Liq. Mag. Cit.

Magnesium Citrate Solution contains, in each 100 cc., an amount of magnesium citrate corresponding to not less than 1.6 Gm. and not more than 1.9 Gm. of MgO.

MAGNESIUM CARBONATE	15	Gm.
CITRIC ACID	33	Gm.
SYRUP	60	cc.
TALC	5	Gm.
LEMON OIL	0.1	cc.
POTASSIUM BICARBONATE	2.5	Gm.
DISTILLED WATER, a sufficient quantity,		
To make	350	cc.

Dissolve the citric acid in 150 cc. of hot distilled water in a suitable dish, and, having added the magnesium carbonate, previously mixed with 100 cc. of distilled water, stir until it is dissolved. Then add the syrup, heat the mixed liquids to the boiling point, immediately add the lemon oil, previously triturated with the talc, and filter the mixture, while hot, into a strong bottle (previously rinsed with boiling distilled water) of suitable capacity. Add enough boiled distilled water to make the product measure 350 cc. Stopper the bottle with purified cotton, allow to cool, drop in the potassium bicarbonate, and immediately stopper the bottle securely. Lastly, shake the solution occasionally until the potassium bicarbonate is dissolved.

NOTE—In this process the 2.5 Gm. of potassium bicarbonate may be replaced by 2.1 Gm. of sodium bicarbonate, preferably in tablet form and, in addition, the Solution may be carbonated by the use of CO_2, under pressure.

The stability of Magnesium Citrate Solution is improved by adjusting the quantity of magnesium carbonate for each 350 cc. of Solution so that it corresponds to 6.0 Gm. of MgO and by sterilizing the Solution after it has been bottled.

Description Magnesium Citrate Solution is a colorless to slightly yellow, clear effervescent liquid, having a sweet, acidulous taste and a lemon flavor.

Identification –

A: Magnesium Citrate Solution responds to the tests for *Magnesium*, page 661.

B: To 5 cc. of Magnesium Citrate Solution add 1 cc. of potassium permanganate T.S. and 5 cc. of mercuric sulfate T.S., and heat the solution: a white precipitate is formed.

Chloride—A 2-cc. portion of Magnesium Citrate Solution shows no more *Chloride* than corresponds to 0.3 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 2-cc. portion of Magnesium Citrate Solution shows no more *Sulfate* than corresponds to 0.3 cc. of fiftieth-normal sulfuric acid, page 709.

Tartaric acid—Add 1 cc. of glacial acetic acid and 3 cc. of a solution of potassium acetate (1 in 2) to 10 cc. of Magnesium Citrate Solution in a test tube, shake the mixture vigorously, then gently rub the inner wall of the test tube with a glass rod for a few minutes, and allow to stand for 1 hour: no white, crystalline precipitate soluble in ammonia T.S. is produced.

Minimum of total citric acid—Measure accurately 10 cc. of Magnesium Citrate Solution, which has been previously freed from excessive carbon dioxide by repeated

pouring into a 250-cc. beaker, and dilute with 30 cc. of water. Add 3 drops of phenolphthalein T.S. and just enough normal sodium hydroxide to give the liquid a persistent pink color, and then acidify with 4 drops of normal hydrochloric acid. Add 20 cc. of calcium chloride T.S., and concentrate, by boiling, to about 30 cc., stirring constantly with a rubber-tipped glass rod during the boiling. Completely transfer the precipitate from the hot mixture to a filter of from 9 to 11 cm. in diameter with the aid of small quantities of boiling water. Then wash the precipitate five times with boiling water. Collect the filtrate and washings in a 150-cc. beaker, and concentrate the solution, by boiling, to about 20 cc. Add sufficient ammonia T.S., drop by drop, to give the liquid a distinct red color, and then concentrate to about 10 cc. Transfer the precipitate completely from the hot mixture to a filter of from 7 to 9 cm. in diameter with the aid of small quantities of boiling water, and wash the precipitate six times with 5-cc. portions of boiling water.

Dry the two filters with the precipitates, and incinerate them together in a loosely covered platinum crucible, heating at first at a low temperature until the precipitates are well charred, and then removing the cover and raising the temperature until the residue is nearly white. If a gas flame is used, it must not come in contact with the mass in the crucible. Cool, place the crucible with its contents in a suitable beaker, add about 30 cc. of water, and then exactly 50 cc. of half-normal hydrochloric acid. When the residue has dissolved, remove the crucible, rinsing it well with water into the beaker. Add 100 cc. of water, cover the beaker with a watch glass, and boil gently for 10 minutes. Cool, and titrate the excess of acid with half-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Not less than 26 cc. of half-normal hydrochloric acid is consumed (9.10 Gm. in 100 cc. of the solution).

Assay for magnesium oxide—Transfer to a 100-cc. volumetric flask exactly 50 cc. of Magnesium Citrate Solution which has been previously freed from excessive carbon dioxide by repeated pouring. Dilute to the mark with water, and mix thoroughly. Transfer exactly 5 cc. of this dilution to a beaker containing 150 cc. of water heated to 70° to 80°, add 1 cc. of ammonium chloride T.S., and then 3 cc. of stronger ammonia T.S. Mix thoroughly and add slowly, with stirring, 8 cc. of 8-hydroxyquinoline T.S. After standing for 30 minutes, pour off the supernatant liquid through a sintered-glass filter crucible, previously dried and weighed. Wash the precipitate three times by decantation, using 20 cc. portions of water, then transfer it completely to the filter, and wash thoroughly with water. Dry the crucible and contents for 3 hours at 100° to 105°, cool, and weigh. The weight of magnesium hydroxyquinolate, multiplied by 4.628, gives the equivalent of MgO in 100 cc. of the Solution.

Packaging and storage—Preserve Magnesium Citrate Solution in a cold place, preferably in a refrigerator, keeping the bottle on its side. Package Magnesium Citrate Solution in bottles containing not less than 340 cc. and not more than 360 cc. or in bottles containing not less than 195 cc. and not more than 205 cc.

AVERAGE DOSE—**200 cc.** (approximately 7 fluidounces).

Magnesium Oxide

MAGNESIUM OXIDE

Magnesii Oxidum

Mag. Oxid.—Magnesia, Light Magnesia

MgO Mol. wt. 40.32

Magnesium Oxide contains, after ignition, not less than 96 per cent of MgO.

Description—Magnesium Oxide occurs as a very bulky, white powder. It readily absorbs moisture and carbon dioxide when exposed to air.

Solubility—Magnesium Oxide is practically insoluble in water and is insoluble in alcohol. It is soluble in dilute acids.

Identification—A solution of Magnesium Oxide in diluted hydrochloric acid responds to the tests for *Magnesium*, page 661.

Loss on ignition—Transfer to a tared platinum crucible about 500 mg. of Magnesium Oxide, weigh accurately, and ignite to constant weight: the loss in weight does not exceed 10 per cent.

Free alkali and soluble salts—Boil 2 Gm. of Magnesium Oxide with 100 cc. of water for 5 minutes in a covered beaker, then filter while hot. Titrate 50 cc. of the cooled filtrate with tenth-normal sulfuric acid, using methyl red T.S. as the indicator: not more than 2 cc. of the acid is consumed. Evaporate 25 cc. of the filtrate to dryness, and dry at 120° for 3 hours: not more than 10 mg. of residue remains.

Acid-insoluble substances—Mix 2 Gm. of Magnesium Oxide with 75 cc. of water, and add hydrochloric acid in small portions at a time, with agitation, until no more dissolves. If an insoluble residue remains, filter, wash well with water until the washings show no more chloride, then ignite: the weight of the ignited residue does not exceed 2 mg.

Carbonate—Boil a mixture of 100 mg. of Magnesium Oxide with 5 cc. of water, cool, and add 5 cc. of acetic acid: the Magnesium Oxide dissolves without effervescence.

Arsenic—A solution of 160 mg. of Magnesium Oxide in 5 cc. of diluted hydrochloric acid meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfurous and sulfuric acids (12.5 parts per million).

Calcium oxide—When tested by the method described under *Magnesium Carbonate*, page 293, using about 400 mg. of freshly ignited Magnesium Oxide, accurately weighed, Magnesium Oxide yields not more than 1.5 per cent of calcium oxide.

Heavy metals—Test 1 Gm. of Magnesium Oxide as directed under *Magnesium Carbonate*, page 293, using 20 cc. of diluted hydrochloric acid to obtain solution: the heavy metals limit for Magnesium Oxide is 40 parts per million, page 657.

Iron—Magnesium Oxide meets the requirements of the test for *Iron* under *Magnesium Carbonate*, page 293, using 40 mg. of Magnesium Oxide (0.05 per cent Fe).

Assay—Ignite about 500 mg. of Magnesium Oxide to constant weight in a tared platinum crucible, weigh the residue accurately, dissolve it in 30 cc. of normal sulfuric acid, and determine the residual acid by titrating with normal sodium hydroxide, using methyl orange T.S. as the indicator. From the volume of normal sulfuric acid consumed, deduct the volume of normal sulfuric acid corresponding to the content of calcium oxide in the Magnesium Oxide taken for the assay. The difference is the volume of normal sulfuric acid equivalent to the Magnesium Oxide present. Each cc. of normal sulfuric acid is equivalent to 20.16 mg. of MgO or to 28.04 mg. of CaO.

Packaging and storage—Preserve Magnesium Oxide in tight containers.

AVERAGE DOSE—Antacid, **0.25 Gm.** (approximately 4 grains).
Laxative, **4 Gm.** (approximately 60 grains).

Magnesium Oxide, Heavy

HEAVY MAGNESIUM OXIDE

Magnesii Oxidum Ponderosum

Mag. Oxid. Pond.—Heavy Magnesia

MgO Mol. wt. 40.32

Heavy Magnesium Oxide contains, after ignition, not less than 96 per cent of MgO.

Description—Heavy Magnesium Oxide occurs as a relatively dense, white powder. It absorbs moisture and carbon dioxide when exposed to air.
Other tests—Heavy Magnesium Oxide meets the requirements for *Identification*, *Loss on ignition*, *Soluble salts*, *Acid-insoluble substances*, *Carbonate*, *Arsenic*, *Calcium oxide*, *Heavy metals*, *Iron*, and the *Assay* under *Magnesium Oxide*, page 296.
Packaging and storage—Preserve Heavy Magnesium Oxide in tight containers.

AVERAGE DOSE—Antacid, **0.25 Gm.** (approximately 4 grains).
Laxative, **4 Gm.** (approximately 60 grains).

Magnesium Sulfate

MAGNESIUM SULFATE

Magnesii Sulfas

Mag. Sulf. Epsom Salt

$MgSO_4 \cdot 7H_2O$ Mol. wt. 246.49

Magnesium Sulfate, when rendered anhydrous by ignition, contains not less than 99.5 per cent of $MgSO_4$.

Description—Magnesium Sulfate occurs as small, colorless crystals, usually needle-like, with a cooling, saline, and bitter taste. Its solutions are neutral to litmus paper. It effloresces in warm, dry air.
Solubility—One Gm. of Magnesium Sulfate dissolves in 1 cc. of water and dissolves slowly in about 1 cc. of glycerin. One Gm. of it dissolves in 0.2 cc. of boiling water. It dissolves sparingly in alcohol.
Identification—A solution of Magnesium Sulfate (1 in 20) responds to the tests for *Magnesium*, page 661, and for *Sulfate*, page 663.
Loss on ignition—Weigh accurately about 1 Gm. of Magnesium Sulfate in a crucible, heat for an hour or two at about 100°, then ignite at a dull red heat until the weight is constant: the loss in weight is not less than 40 per cent and not more than 52 per cent.
Chloride—One Gm. of Magnesium Sulfate shows no more *Chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 709.
Arsenic—A 5-cc. portion of a solution of Magnesium Sulfate (1 in 10) meets the requirements of the test for *Arsenic*, page 618.
Heavy metals—Dissolve 2 Gm. of Magnesium Sulfate in 10 cc. of water, add 2 cc. of diluted acetic acid, and dilute with water to 25 cc.: the heavy metals limit, page 657, for Magnesium Sulfate is 10 parts per million.
Assay—Weigh accurately about 300 mg. of the ignited Magnesium Sulfate obtained in the test for *Loss on drying*, and dissolve it in 100 cc. of water and 1 cc. of hydrochloric acid. Add to the solution 1.5 Gm. of dibasic ammonium phosphate, dissolved in a small amount of water, and mix well. Add, dropwise, with constant

stirring, ammonia T.S. until the solution has a distinct odor of ammonia. Add 40 cc. of ammonia T.S. and allow the mixture to stand for at least 4 hours. Filter and wash the precipitate with small quantities of a mixture of 1 volume of ammonia T.S. and 3 volumes of water until free from sulfate. Dry, and ignite the precipitate to constant weight. The weight of the magnesium pyrophosphate ($Mg_2P_2O_7$), multiplied by 1.082, indicates the equivalent weight of $MgSO_4$.

Packaging and storage—Preserve Magnesium Sulfate in well-closed containers.

AVERAGE DOSE—**15 Gm.** (approximately 4 drachms).

Magnesium Trisilicate

MAGNESIUM TRISILICATE

Magnesii Trisilicas

Mag. Trisil.

$2MgO.3SiO_2\ nH_2O$

Magnesium Trisilicate is a compound of magnesium oxide and silicon dioxide with varying proportions of water. It contains not less than 20 per cent of magnesium oxide (MgO) and not less than 45 per cent of silicon dioxide (SiO_2).

Description—Magnesium Trisilicate is a fine, white, odorless, tasteless powder, free from grittiness.

Solubility—Magnesium Trisilicate is insoluble in water and in alcohol. It is readily decomposed by mineral acids.

Identification—

A: Mix about 500 mg. of Magnesium Trisilicate with 10 cc. of diluted hydrochloric acid, filter, and neutralize the filtrate to litmus paper with ammonia T.S.: the neutralized filtrate responds to the tests for *Magnesium*, page 661.

B: Prepare a bead by fusing a few crystals of sodium ammonium phosphate on a platinum loop in the flame of a Bunsen burner. Place the hot, transparent bead in contact with Magnesium Trisilicate, and again fuse. Silica floats about in the bead, producing, upon cooling, an opaque bead with a web-like structure.

Loss on ignition—Weigh accurately about 1 Gm. of Magnesium Trisilicate in a tared platinum crucible provided with a cover. Gradually apply heat to the crucible at first, then strongly ignite to constant weight: the loss in weight does not exceed 34 per cent.

Acid-consuming capacity—Weigh accurately about 200 mg. of Magnesium Trisilicate into a 125-cc., glass-stoppered Erlenmeyer flask. Add exactly 30 cc. of tenth-normal hydrochloric acid and exactly 20 cc. of water. Place the flask in a bath

maintained at 37°, and shake the mixture occasionally during a period of 4 hours, but leave the mixture undisturbed during the last 15 minutes of the heating period. Remove the flask from the bath, cool to room temperature, and withdraw with a pipette exactly 25 cc. of the supernatant liquid. Titrate the excess acid in this 25-cc. portion with tenth-normal sodium hydroxide, using methyl orange T.S. as the indicator. One Gm. of Magnesium Trisilicate, calculated on the anhydrous basis, consumes not less than 140 cc. and not more than 160 cc. of tenth-normal hydrochloric acid.

Soluble salts—Boil 10 Gm. of Magnesium Trisilicate with 150 cc. of water for 15 minutes. Cool to room temperature, and restore to the original volume by adding water. Allow the mixture to stand for 15 minutes, and filter. Dilute 75 cc. of the clear filtrate to 100 cc. with water. Evaporate 50 cc. of this solution, representing 2.5 Gm. of the Trisilicate, to dryness in a tared platinum dish on a water bath, and ignite gently to constant weight: the weight of the residue does not exceed 38.0 mg.

Chloride—Add 0.2 cc. of nitric acid and 1 cc. of silver nitrate T.S. to 20 cc. of the diluted filtrate prepared in the previous test, and representing 1 Gm. of the Trisilicate. After 5 minutes the opalescence of the solution does not exceed that of a standard solution prepared at the same time by adding 0.2 cc. of nitric acid, 0.75 cc. of fiftieth-normal hydrochloric acid and 1 cc. of silver nitrate T.S. to 20 cc. of water.

Sulfate—Treat the residue obtained in the test for *Soluble salts* with 2 cc. of hydrofluoric acid, and evaporate to dryness on a water bath. Mix the residue with water, transfer to a filter, and wash, using approximately 50 cc. of water for the complete procedure. Heat the filtrate to boiling, and add 0.1 cc. of hydrochloric acid and 5 cc. of barium chloride T.S. Maintain the mixture near its boiling point for 1 hour, filter, wash the precipitate thoroughly with water, dry, and ignite to constant weight: the weight of the residue does not exceed 30.0 mg.

Free alkali—Add 2 drops of phenolphthalein T.S. to 20 cc. of the diluted filtrate prepared in the test for *Soluble salts*, and representing 1 Gm. of the Trisilicate: if a pink color is produced, not more than 1 cc. of tenth-normal hydrochloric acid is required to discharge it.

Arsenic—A 200-mg. portion of Magnesium Trisilicate meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Boil 3 Gm. of Magnesium Trisilicate with 50 cc. of water and 5 cc. of hydrochloric acid for 20 minutes. Add stronger ammonia T.S. until the mixture is only slightly acid to litmus paper. Filter, and wash with from 15 to 20 cc. of water, combining the washings with the original filtrate. Add 2 drops of phenolphthalein T.S. and then a slight excess of ammonia T.S. Discharge the pink color with tenth-normal hydrochloric acid, and then add 8 cc. of tenth-normal hydrochloric acid. Dilute to 75 cc. with water, and use 25 cc. of this solution for the test. The heavy metals limit, page 657, for Magnesium Trisilicate is 30 parts per million.

Assay for magnesium oxide—Weigh accurately about 1.5 Gm. of Magnesium Trisilicate, and transfer to a 250-cc. Erlenmeyer flask. Add exactly 50 cc. of normal sulfuric acid, and digest on a steam bath for 15 minutes. Cool to room temperature, and titrate the excess acid with normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 20.16 mg. of MgO.

Assay for silicon dioxide—Transfer about 700 mg. of Magnesium Trisilicate, accurately weighed, to a 150-cc. beaker. Add 10 cc. of normal sulfuric acid, and heat on a steam bath for 1 hour and 30 minutes. Treat the residue with 25 cc. of water, and digest on a steam bath for 15 minutes. Decant the supernatant liquid through an ashless filter paper, and wash the residue, by decantation, three times with hot water. Finally transfer the residue to the filter, and wash thoroughly with hot water. Transfer the filter paper and its contents to a platinum crucible. Heat to dryness, incinerate, ignite strongly for 30 minutes, cool, and weigh. Moisten the residue with water, and add 6 cc. of hydrofluoric acid and 3 drops of sulfuric acid. Evaporate to dryness, ignite for 5 minutes, cool, and weigh: the loss in weight represents the silicon dioxide and is not less than 45 per cent of the weight of the Magnesium Trisilicate taken for the assay.

Ratio of MgO to SiO_2—Divide the percentage of SiO_2 obtained in the *Assay for silicon dioxide* by the percentage of MgO obtained in the *Assay for magnesium oxide*. The quotient obtained is not less than 2.10 and not more than 2.30.
Packaging and storage—Preserve Magnesium Trisilicate in well-closed containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

MAGNESIUM TRISILICATE TABLETS

Tabellæ Magnesii Trisilicatis

Tab. Mag. Trisil.

Magnesium Trisilicate Tablets conform to the tests given below.

Weigh a counted number of not less than 20 Magnesium Trisilicate Tablets, and reduce them without appreciable loss to a powder, all of which passes through a 200 mesh sieve. Use this powder for the following tests:

Identification—

A: Mix a quantity of the powder, equivalent to about 500 mg. of magnesium trisilicate, with 10 cc. of diluted hydrochloric acid, allow to stand for 20 minutes, and filter. The filtrate responds to the tests for *Magnesium*, page 661.

B: Ignite a portion of the powder until any organic matter present is consumed. Prepare a bead by fusing a few crystals of sodium ammonium phosphate on the loop of a platinum wire. Place the hot, transparent bead in contact with the ignited magnesium trisilicate, and fuse again: silica floats about in the bead, producing, upon cooling, an opaque bead with a web-like structure.

Free alkali—Boil a quantity of the powder, equivalent to 1.0 Gm. of magnesium trisilicate, with 40 cc. of water for 2 minutes. Cool, add sufficient water to restore the original volume, filter, and add 2 drops of phenolphthalein T.S. to 20 cc. of the filtrate. If a pink color is produced, it is discharged by the addition of not more than 0.5 cc. of tenth-normal hydrochloric acid.

Acid-consuming capacity—Weigh accurately a quantity of the powder corresponding to 200 mg. of magnesium trisilicate, and transfer it to a 125-cc. glass-stoppered Erlenmeyer flask. Add exactly 30 cc. of tenth-normal hydrochloric acid and exactly 20 cc. of water. Place the flask in a water bath maintained at 37°, and shake the flask occasionally during 4 hours, but leaving the mixture undisturbed during the last 15 minutes. Remove the flask from the bath, cool to room temperature, withdraw by means of a pipette 25 cc. of the supernatant liquid, and titrate the excess acid with tenth-normal sodium hydroxide, using methyl orange T.S. as the indicator. The volume of tenth-normal acid consumed corresponds to not less than 85 cc. and not more than 110 cc. per Gm. of the magnesium trisilicate taken.

Packaging and Storage—Preserve Magnesium Trisilicate Tablets in well-closed containers.

Labeling—The label shall indicate the quantity of magnesium trisilicate contained in each Tablet.

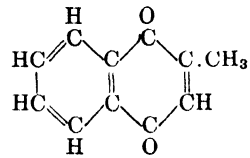
Sizes—Magnesium Trisilicate Tablets usually available contain the following amounts of magnesium trisilicate: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DOSE OF MAGNESIUM TRISILICATE—**1 Gm.** (approximately 15 grains).

MENADIONE

Menadionum

Menadion.—2-Methyl-Naphthoquinone, Menaphthene, Menaphthone



$C_{11}H_8O_2$ Mol. wt. 172.17

Menadione, when dried over sulfuric acid in a vacuum desiccator for 4 hours, contains not less than 98.5 per cent of $C_{11}H_8O_2$.

Caution—Menadione powder is irritating to the respiratory tract and to the skin, and an alcoholic solution has vesicant properties.

Description—Menadione occurs as a bright yellow, crystalline powder, and is nearly odorless. It is affected by sunlight.

Solubility—Menadione is practically insoluble in water. One Gm. dissolves in about 60 cc. of alcohol, and in about 10 cc. of benzene. It is moderately soluble in chloroform and in carbon tetrachloride, and is soluble in vegetable oils.

Melting range—Menadione melts between 105° and 107°, page 667.

Identification—To 50 mg. of Menadione add 5 cc. of water, then add 75 mg. of sodium bisulfite, and heat on a steam bath, shaking vigorously until the substance is dissolved and the solution is almost colorless. Add sufficient water to make 50 cc., and mix well. To 2 cc. of the solution add 2 cc. of alcoholic ammonia (prepared by mixing equal volumes of alcohol and stronger ammonia T.S.), shake, and add 3 drops of ethyl cyanoacetate: a deep purplish blue color is produced which, on the addition of 1 cc. of sodium hydroxide solution (1 in 3), changes to green and then to yellow.

Loss on drying—When dried in a vacuum desiccator over sulfuric acid for 4 hours, Menadione loses not more than 0.3 per cent of its weight.

Residue on ignition—Menadione yields not more than 0.1 per cent of residue on ignition, page 685.

Assay—Weigh accurately about 150 mg. of Menadione, previously dried over sulfuric acid in a vacuum desiccator for 4 hours in the dark, and transfer it completely to a 150-cc. flask. Add 15 cc. of glacial acetic acid and 15 cc. of diluted hydrochloric acid, and rotate the flask until the Menadione is dissolved. Then add about 1 Gm. of zinc dust, close the flask with a stopper bearing a Bunsen valve, and allow to stand in the dark for 30 minutes, with occasional shaking. Rapidly decant the solution through a pledget of cotton into another flask, immediately wash the reduction flask with three 10-cc. portions of freshly boiled and cooled water, and at once titrate the combined filtrate and washings with tenth-normal ceric sulfate, using 0.1 cc. of ortho-phenanthroline T.S. as the indicator. Perform a blank test with

the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal ceric sulfate is equivalent to 8.609 mg. of $C_{11}H_8O_2$.

Packaging and storage—Preserve Menadione in well-closed, light-resistant containers.

AVERAGE DOSE—1 mg. (approximately 1/60 grain).

Menadione Tablets

MENADIONE TABLETS

Tabellæ Menadioni

Tab. Menadion.

Menadione Tablets contain not less than 95 per cent and not more than 110 per cent of the labeled amount of $C_{11}H_8O_2$.

Identification—Powder a sufficient number of Menadione Tablets to yield about 10 mg. of Menadione. Macerate the powder with two successive portions of 10 cc each of chloroform, and decant the chloroform solution through a filter. Evaporate the chloroform extract to dryness with the aid of a current of air while protected from light. To 5 mg. of the residue add 1 cc. of water and 7.5 mg. of sodium bisulfite, and heat on steam bath, shaking vigorously until the Menadione is dissolved and the solution is nearly colorless. Dilute to 5 cc. with water, and mix well. To 2 cc. of the solution add 2 cc. of alcoholic ammonia (prepared by mixing equal volumes of alcohol and stronger ammonia T.S.), shake, and add 3 drops of ethyl cyanoacetate: a deep purplish blue color is produced which, on the addition of 1 cc. of a solution of sodium hydroxide (1 in 3), changes to green and then to yellow.

Assay—Weigh a counted number of not less than 20 Menadione Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 20 mg. of menadione, and triturate it well with 10 cc. of chloroform. Allow the powder to subside, then decant the liquid through a sintered glass filter into a flask. Repeat the trituration twice in a similar manner with 10-cc. portions of chloroform. Finally transfer the residue to the filter with the aid of chloroform, and wash the triturating vessel and filter with 5-cc. portions of chloroform until the washings are colorless. Evaporate the combined chloroform extracts and washings to dryness with the aid of a current of air while protected from light. Add to the residue 7 cc. of glacial acetic acid, agitate until dissolved, then add 10 cc. of diluted hydrochloric acid and about 500 mg. of zinc dust. Stopper the flask with a Bunsen valve, and allow to stand in the dark for 20 minutes, or until the solution is colorless. Rapidly decant the liquid through a pledget of cotton into another flask, wash the flask in which the reduction was made and the filter with three 5-cc. portions of freshly boiled and cooled water, then titrate at once the combined filtrate and washings with fiftieth-normal ceric sulfate, using 0.1 cc. of ortho-phenanthroline T.S. as the indicator. Perform a blank test with the same reagents and in the same manner, and make any necessary correction. Each cc. of fiftieth-normal ceric sulfate is equivalent to 1.722 mg. of $C_{11}H_8O_2$.

If the Tablets contain stearic acid, proceed as follows: Shake the chloroform extract of the Tablets, obtained as described in the preceding paragraph, with a mixture of 2 cc. of normal sodium hydroxide and 8 cc. of water, allow to separate, and pass the chloroform layer through a filter moistened with chloroform. Wash the water layer with 10 cc. of chloroform, and add this chloroform to the main chloroform solution. Finally wash the filter with about 10 cc. of chloroform, then proceed as described in the foregoing paragraph, beginning with the words "Evaporate the combined chloroform extracts and washings."

Packaging and storage—Preserve Menadione Tablets in well-closed containers.
Sizes—Menadione Tablets usually available contain the following amount of menadione: 1 and 2 mg. (1/60 and 1/30 grain).

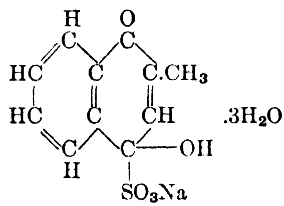
AVERAGE DOSE OF MENADIONE—**1 mg.** (approximately 1/60 grain).

Menadione Sodium Bisulfite

MENADIONE SODIUM BISULFITE

Menadioni Sodii Bisulfis

Menadion. Sod. Bisulfis—Menadione Bisulfite



$C_{11}H_8O_2.NaHSO_3.3H_2O$ Mol. wt. 330.29

Menadione Sodium Bisulfite contains not less than 49 per cent of menadione ($C_{11}H_8O_2$), corresponding to not less than 94 per cent of $C_{11}H_8O_2.NaHSO_3.3H_2O$.

Description—Menadione Sodium Bisulfite occurs as a white, crystalline, odorless hygroscopic powder.

Solubility—One Gm. of Menadione Sodium Bisulfite dissolves in about 2 cc. of water. It is slightly soluble in alcohol, and is almost insoluble in ether and in benzene.

Identification—

A: The menadione obtained in the *Assay* melts between 101° and 107° and responds to the *Identification test* under *Menadione*, page 302.

B: To 5 cc. of a solution of Menadione Sodium Bisulfite (1 in 100) add tenth-normal sodium hydroxide, drop by drop: a bright yellow precipitate of menadione is produced.

Loss on drying—When dried at 100° in a vacuum desiccator over phosphorus pentoxide for 3 hours, Menadione Sodium Bisulfite loses not less than 11 per cent and not more than 16 per cent of its weight.

2-Methyl-1,4-naphthohydroquinone-3-sulfonate—Dissolve 100 mg. of Menadione Sodium Bisulfite in 5 cc. of water, and add 2 drops of ortho-phenanthroline T.S.: no precipitate is formed.

Assay—Dissolve about 300 mg. of Menadione Sodium Bisulfite, accurately weighed, in 20 cc. of water in a separatory funnel. Add 5 cc. of sodium hydroxide T.S., and extract the precipitated menadione with three 20-cc. portions of chloroform. Wash the combined chloroform extract with 10 cc. of water, filter the combined chloroform extracts through a filter paper moistened with chloroform, and wash the filter

paper with 5 cc. of chloroform. Evaporate the combined chloroform solutions to dryness with the aid of a current of air, add 2 cc. of alcohol to the residue, evaporate to dryness, dry the residue at 80° for 2 hours, cool, and weigh.

Packaging and storage—Preserve Menadione Sodium Bisulfite in tight, light-resistant containers.

AVERAGE DOSE—Intramuscular or intravenous, **2 mg.** (approximately 1/30 grain).

MENADIONE SODIUM BISULFITE INJECTION

Injectio Menadioni Sodii Bisulfitis

Inj. Menadion. Sod. Bisulfit.

Menadione Sodium Bisulfite Injection is a sterile solution of menadione sodium bisulfite in water for injection. It contains an amount of menadione, $C_{11}H_8O_2$, equivalent to not less than 47 per cent and not more than 57 per cent of the labeled amount of menadione sodium bisulfite. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Menadione Sodium Bisulfite Injection, preferably by Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—

A: The menadione obtained in the assay melts between 104° and 107° and responds to the *Identification test* under *Menadione*, page 302.

B: Sulfur dioxide, recognizable by its odor, is evolved on the addition of 2 to 3 drops of diluted hydrochloric acid to about 1 cc. of the Injection and warming.

Assay—Transfer an accurately measured volume of the Injection obtained in the test for *Determination of Volume of Injection in Containers*, page 665, equivalent to about 50 mg. of menadione sodium bisulfite, to a small separator. Add 10 cc. of chloroform, then add sodium hydroxide T.S. until the reaction is strongly alkaline. Shake gently, allow to separate and draw off the chloroform, filtering it through a small paper moistened with chloroform into a tared dish. Extract the water layer with two successive 10-cc. portions of chloroform, and filter them as before into the dish. Evaporate the combined chloroform solutions to dryness with the aid of a current of air, add 2 cc. of alcohol to the residue, evaporate to dryness, dry the residue at 80° for 2 hours, cool, and weigh.

Packaging and storage—Preserve Menadione Sodium Bisulfite Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

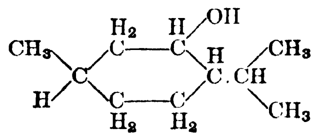
Sizes—Menadione Sodium Bisulfite Injection usually available contains the following amounts of menadione sodium bisulfite: 2 mg. (1/30 grain) in 1/2 cc.; 4 mg. (1/15 grain) in 1 cc.

AVERAGE DOSE—Intramuscular or intravenous, **2 mg.** (approximately 1/30 grain).

Menthol

MENTHOL

Menthol



$C_{10}H_{20}O$ Mol. wt. 156.26

Menthol is an alcohol obtained from peppermint oil or other mint oils or prepared synthetically. Menthol may be lævorotatory (*l*-Menthol) from natural or synthetic sources, or racemic (*dl*-Menthol) produced synthetically.

Description—Menthol occurs as colorless, hexagonal crystals, usually needle-like, or in fused masses, or as a crystalline powder, and has a pleasant, peppermint-like odor.

Solubility—Menthol is slightly soluble in water. It is very soluble in alcohol, in chloroform, in ether, and in petroleum benzin. It is freely soluble in glacial acetic acid, in liquid petrolatum, and in fixed and volatile oils.

Melting range of *l*-Menthol—Lævo Menthol melts between 41° and 43°, page 667.

Congealing range of *dl*-Menthol—*Preferably perform this test in a room having a temperature below 30° and a relative humidity below 50 per cent.* Place about 10 Gm. of racemic Menthol, previously dried over sulfuric acid in a desiccator for 24 hours, in a dry test tube of from 18 to 20 mm. internal diameter, and melt the contents at a temperature of about 40°. Suspend the test tube in water having a temperature of 23° to 25°, and stir the contents of the tube continually with a thermometer of Type V, page 701, keeping the bulb of the thermometer immersed in the liquid. Racemic Menthol congeals at a temperature between 27° and 28°. Continue the stirring: after a few minutes the temperature of the mass quickly rises to 30.5° to 32°.

Identification—When Menthol is triturated with about an equal weight of camphor, of chloral hydrate, of phenol, or of thymol, the mixture liquefies.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of lævo Menthol, determined in a solution containing 10 Gm. in sufficient alcohol to make 100 cc. and using a 200-mm. tube, is between −45° and −51°. The specific rotation of racemic Menthol, determined in the same manner, is between −2° and +2°.

Readily oxidizable substances in racemic Menthol—Place 500 mg. of racemic Menthol in a clean, dry test tube, add 10 cc. of a solution of potassium permanganate, prepared by diluting 3 cc. of tenth-normal potassium permanganate to 100 cc. with

water, and place the test tube in a beaker of water at a temperature between 45° and 50°. Remove the tube from the bath at intervals of 30 seconds and mix quickly by shaking: the purple color of potassium permanganate is still apparent after 5 minutes.

Non-volatile substances—Heat 2 Gm. of Menthol in a tared open porcelain dish on a water bath: it gradually volatilizes, leaving not more than 1 mg. of residue.

Storage—Preserve Menthol in tight containers, preferably at a temperature not above 30°.

Labeling—The label on the container of Menthol shall state whether the Menthol is lævo or racemic.

Mercurial Ointment, Mild

MILD MERCURIAL OINTMENT

Unguentum Hydrargyri Mite

Ung. Hydrarg. Mit.—Diluted Mercurial Ointment, Blue Ointment, Unguentum hydrargyri P.I.

Mild Mercurial Ointment contains not less than 9 per cent and not more than 11 per cent of Hg.

Strong Mercurial Ointment	200 Gm.
White Ointment	800 Gm.
To make	1000 Gm.

Incorporate the strong mercurial ointment with the white ointment (see page 2).

Assay—Proceed as directed under *Strong Mercurial Ointment*, page 307, using about 4 Gm. of Mild Mercurial Ointment, accurately weighed.

Mercurial Ointment, Strong

STRONG MERCURIAL OINTMENT

Unguentum Hydrargyri Forte

Ung. Hydrarg. Fort. Unguentum Hydrargyri, Mercurial Ointment

Strong Mercurial Ointment contains not less than 47.5 per cent and not more than 52.5 per cent of Hg.

Mercury	500 Gm.
Mercury Oleate	40 Gm.
Wool Fat	300 Gm.
White Wax	50 Gm.
White Petrolatum	110 Gm.
To make about	1000 Gm.

Triturate the mercury oleate in a warm mortar, add the mercury gradually, and when all of the mercury is dispersed, set the mixture aside for about 15 minutes. Melt together the wool fat, white wax, and white petrolatum, allow to cool partially, add about 25 Gm. of the wool fat-petrolatum mixture to the mercurial mixture, and continue the trituration until the globules of mercury are no longer visible under a lens magnifying 10 diameters. Then add the remainder of the wool fat-petrolatum mixture, and mix thoroughly.

Assay—Weigh accurately about 800 mg. of Strong Mercurial Ointment, mix it in a suitable flask with 20 cc. of water and 20 cc. of nitric acid, and warm the mixture gently until red fumes cease to be evolved and the solution is colorless. Cool, add 100 cc. of water, filter through a filter paper previously moistened with diluted nitric acid, and wash the filter with warm water. To the combined, cooled filtrate and washings add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.03 mg. of Hg.

Mercuric Oxide, Yellow

YELLOW MERCURIC OXIDE

Hydrargyri Oxidum Flavum

Hydrarg. Oxid. Flav.—Yellow Precipitate

HgO Mol. wt. 216.61

Yellow Mercuric Oxide, when dried at 110° to constant weight, contains not less than 99.5 per cent of HgO.

Description—Yellow Mercuric Oxide is a yellow to orange yellow, heavy, impalpable powder. It is odorless and is stable in air, but becomes discolored on exposure to light.

Solubility—Yellow Mercuric Oxide is practically insoluble in water, and is insoluble in alcohol. It is readily soluble in diluted hydrochloric and diluted nitric acids, forming colorless solutions.

Identification—Mix 1 Gm. of Yellow Mercuric Oxide with 20 cc. of water, and add just enough hydrochloric acid, drop by drop, to effect solution: this solution responds to the tests for *Mercuric Compounds*, page 662.

Loss on drying—When dried to constant weight at 110°, Yellow Mercuric Oxide loses not more than 2 per cent of its weight.

Residue on ignition—When Yellow Mercuric Oxide is strongly heated, it volatilizes, leaving not more than 0.2 per cent of residue.

Acid-insoluble substances—A solution of 500 mg. of Yellow Mercuric Oxide in 25 cc. of either diluted hydrochloric or diluted nitric acid is not more than slightly turbid.

Free alkali—When moistened with hot water, Yellow Mercuric Oxide is not alkaline to litmus paper.

Distinction from red mercuric oxide—Dissolve 1 Gm. of oxalic acid in 1 cc. of ammonia T.S., diluted with 10 cc. of water. To this solution add 500 mg. of Yellow Mercuric Oxide, and heat the mixture in a test tube on a water bath for 2 hours, replacing from time to time the water lost by evaporation: the Oxide is converted into white or yellowish white mercuric oxalate.

Assay—Dry about 500 mg. of Yellow Mercuric Oxide at 110° to constant weight, weigh accurately, dissolve it in a mixture of 10 cc. of water and 5 cc. of nitric acid, and dilute the solution with 150 cc. of cold water. Then add 2 cc. of ferric-ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.83 mg. of HgO.

Packaging and storage—Preserve Yellow Mercuric Oxide in well-closed, light-resistant containers.

Mercuric Oxide, Yellow, Ointment

YELLOW MERCURIC OXIDE OINTMENT

Unguentum Hydrargyri Oxidi Flavi

Ung. Hydrarg. Oxid. Flav.

Caution—During its manufacture and storage this Ointment must not come in contact with metallic utensils or containers except those made of tin or tin-coated.

Yellow Mercuric Oxide Ointment contains not less than 0.9 per cent and not more than 1.1 per cent of HgO.

Yellow Mercuric Oxide, in very fine powder.......	10 Gm.
Liquid Petrolatum..................................	10 Gm.
White Ointment..................................	980 Gm.
To make..........................	1000 Gm.

Triturate the yellow mercuric oxide with the liquid petrolatum until the mixture is smooth, and then incorporate the white ointment (see page 2).

Assay—Weigh accurately about 10 Gm. of Yellow Mercuric Oxide Ointment, and transfer it, with the aid of 50 cc. of ether, to a small beaker. Stir the mixture thoroughly, then filter through a small, retentive paper filter, keeping the funnel covered with a watch glass during the filtration. Remove any mercuric oxide adhering to the beaker with the aid of small pieces of filter paper, and add these to the filter. Wash the filter with small portions of ether, then allow any ether on the filter to evaporate at room temperature. Carefully fold the filter with the precipitate, and place it in a 500-cc. Kjeldahl flask. Add 15 cc. of sulfuric acid, and gently swirl the flask to wet thoroughly the paper with the acid. Then add cautiously 10 cc. of nitric acid, and mix gently. Insert a small funnel in the neck of the flask, incline the flask at an angle of about 45°, and heat it at first gently, then more strongly, until a colorless or practically colorless solution results. Allow to cool sufficiently, and carefully add through the funnel about 50 cc. of water, rinsing the stem of the funnel with a few cc. of water and allowing the rinsings to run into the flask. Gently boil the solution to expel oxides of nitrogen, then add to the still warm solution potassium permanganate T.S. until a slight pink color persists. Cool, add just sufficient oxalic acid T.S. to discharge the pink color, then add 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S. Dilute with about 50 cc. of water, and titrate the cold solution with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.83 mg. of HgO.

Mercurophylline Injection

MERCUROPHYLLINE INJECTION

Injectio Mercurophyllinæ

Inj. Mercurophyll.

Mercurophylline Injection is a sterile solution in water for injection of the sodium salt of β-methoxy-γ-hydroxymercuripropylamide of trimethylcyclopentanedicarboxylic acid ($C_{14}H_{24}NO_5HgNa$) (the mercuri compound) and of theophylline in approximately molecular proportions. It contains mercury (Hg) equivalent to not less than 37 per cent and not more than 42 per cent of the labeled amount of the mercuri compound, and theophylline equivalent to not less than 93 per cent and not more than 107 per cent of the labeled amount of theophylline ($C_7H_8N_4O_2.H_2O$). It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Mercurophylline Injection preferably by Process D. See *Sterilization Processes*, page 692.

The Injection conforms to the other requirements under *Injections*, page 664.

Description—Mercurophylline Injection is a clear, faintly yellow, odorless liquid and has a slightly alkaline reaction (pH about 8 to 9).

Identification—

A: To a volume of Mercurophylline Injection equivalent to about 200 mg. of the mercuri compound, add 6 cc. of a mixture of 1 cc. of glacial acetic acid, 9 cc. of water, and 500 mg. of ammonium chloride. Heat the mixture on a steam bath, and bubble hydrogen sulfide through the solution: a black precipitate of mercuric sulfide is formed. Continue passing hydrogen sulfide until no more precipitate is formed, then filter while hot, and place the filtrate in a refrigerator over night. Filter, and wash the crystals with a small quantity of ice-cold water, and dry at about 80°: the crystals so obtained melt between 157° and 159°.

B: Add 1 cc. of hydrochloric acid and 100 mg. of potassium chlorate to a volume of the Injection, equivalent to about 10 mg. of theophylline, contained in a porcelain dish. Evaporate to dryness on a steam bath, and invert the dish over a vessel containing some ammonia T.S.: the residue acquires a purple color which is destroyed by alkali.

C: Evaporate a volume of the Injection, equivalent to about 100 mg. of the mercuri compound, to dryness in a porcelain crucible, and ignite: the resulting residue is alkaline to moistened litmus paper, effervesces with acid, and responds to the flame test for *Sodium*.

Mercury ions—To a volume of the Injection, equivalent to about 200 mg. of the mercuri compound, add 0.5 cc. of sodium sulfide T.S.: no color deeper than yellow is observed and no precipitate is formed.

Assay for mercury—Transfer an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 200 mg. of the mercuri compound, into a Kjeldahl flask. Cautiously add 8 cc. of sulfuric acid, insert a small funnel into the neck of the flask, then add slowly 10 cc. of nitric acid. Heat the mixture, at first gently, then more strongly, until the solution is colorless or only slightly yellow, adding more nitric acid if necessary, and keeping the funnel in the neck of the flask during the heating.

Allow the solution to cool sufficiently, and cautiously add through the funnel about 50 cc. of cold water, rinsing the stem of the funnel with a few cc. of water and allowing the rinsings to run into the flask. Add potassium permanganate T.S. to the warm solution, dropwise, until a slight pink color persists. Discharge the pink color by the addition of just sufficient oxalic acid T.S. Cool the solution, add 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.03 mg. of Hg.

Assay for theophylline—Transfer an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 200 mg. of theophylline, to a 200-cc. Erlenmeyer flask, add 1 cc. of sulfuric acid and 50 cc. of water, and bubble hydrogen sulfide through the solution until no more precipitate is formed. Boil the solution gently until no more hydrogen sulfide is expelled, filter while hot, and wash the flask and filter with five 10-cc. portions of hot water. To the combined filtrate and washings add 5 Gm. of ammonium acetate and exactly 20 cc. of tenth-normal silver nitrate. Evaporate the mixture on a steam bath to a volume of about 50 cc., and filter through a filtering crucible while warm. Wash the vessel and filter with three 10-cc. portions of hot water, add 5 cc. of nitric acid to the combined filtrate and washings, and allow to cool to room temperature. Titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 19.82 mg. of $C_7H_8N_4O_2.H_2O$.

Packaging and storage—Preserve Mercurophylline Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Mercurophylline Injection usually available contains the following amounts of the mercuri compound and of theophylline: mercuri compound 100 mg. (1½ grains) and theophylline 40 mg. (⅔ grain) in 1 cc.; mercuri compound 200 mg. (3 grains) and theophylline 80 mg. (1⅓ grains) in 1 cc.

AVERAGE DOSE OF MERCUROPHYLLINE—Intramuscular, an amount equivalent to:

The mercuri compound . . . **0.1 Gm.** (approximately 1½ grains).
Theophylline . . . . **40 mg.** (approximately ⅔ grain).

Mercurous Chloride, Mild

MILD MERCUROUS CHLORIDE

Hydrargyri Chloridum Mite

Hydrarg. Chlorid. Mit.—Mercurous Chloride, Calomel, Subchloride of Mercury

HgCl Mol. wt. 236.07

Mild Mercurous Chloride, when dried over sulfuric acid for 5 hours, contains not less than 99.6 per cent of HgCl.

Description—Mild Mercurous Chloride is a heavy, white, impalpable powder, becoming yellowish white when triturated with strong pressure. It is odorless and is stable in air, but gradually darkens when exposed to light.

Solubility—*Mild Mercurous Chloride is insoluble in water, in alcohol, in ether, and in cold dilute acids.*

Identification—

A: Mild Mercurous Chloride is blackened by contact with calcium hydroxide T.S., with solutions of alkali hydroxides, or with ammonia T.S.

B: When heated in a dry glass tube with an equal weight of anhydrous sodium carbonate, Mild Mercurous Chloride yields metallic mercury which condenses on the wall of the tube. When the residue in the tube is dissolved in nitric acid, filtered, and silver nitrate T.S. added to the filtrate, a white, curdy precipitate is produced.

Loss on drying—When dried over sulfuric acid for 5 hours, Mild Mercurous Chloride loses not more than 0.5 per cent of its weight.

Residue on ignition—When Mild Mercurous Chloride is strongly heated, it volatilizes without fusion or the evolution of brown vapors, and leaves not more than 0.1 per cent of residue.

Ammonia—Heat 1 Gm. of Mild Mercurous Chloride with sodium hydroxide T.S.: no ammonia is evolved.

Mercury bichloride—Shake 2 Gm. of Mild Mercurous Chloride with 20 cc. of ether for 5 minutes, filter, and allow the filtrate to evaporate spontaneously: the residue, dissolved in 10 cc. of water and 2 drops of diluted nitric acid, shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Assay—Dry about 700 mg. of Mild Mercurous Chloride over sulfuric acid for 5 hours, weigh accurately, mix well with 10 cc. of water in a glass-stoppered flask, and add 50 cc. of tenth-normal iodine and 4 Gm. of potassium iodide dissolved in 10 cc. of water. Stopper the flask, allow the mixture to stand with occasional agitation until complete solution takes place, and then titrate the residual iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 23.61 mg. of $HgCl$.

Packaging and storage—Preserve Mild Mercurous Chloride in well-closed, light-resistant containers.

AVERAGE DOSE—**0.12 Gm.** (approximately 2 grains).

Mercury

MERCURY

Hydrargyrum

Hydrarg.—Quicksilver

Hg — At. wt. 200.61

Description—Mercury is a bright, shining, silver white metal, liquid at ordinary temperatures, and easily divisible into globules. Mercury has a specific gravity of about 13.5.

Solubility—Mercury is insoluble in the ordinary solvents, in hydrochloric acid, and at ordinary temperatures in sulfuric acid, but it is soluble in the latter upon boiling. It is readily and completely soluble in nitric acid.

Residue on ignition—Place about 5 Gm. of Mercury, accurately weighed, in a porcelain crucible. Add a mixture of 5 cc. of nitric acid and 3 cc. of water, and cover loosely with a watch glass. When the reaction has subsided, evaporate on a water

bath, and carefully ignite to constant weight: not more than 0.01 per cent of residue remains.

Foreign substances—Drop a few globules of Mercury on white paper: they retain their globular form, roll about freely, and leave no streaks on the paper.

Packaging and storage—Preserve Mercury in strong, well-closed containers.

Mercury, Ammoniated

AMMONIATED MERCURY

Hydrargyrum Ammoniatum

Hydrarg. Ammon.—White Precipitate

$HgNH_2Cl$ Mol. wt. 252.09

Ammoniated Mercury contains not less than 78 per cent and not more than 80 per cent of Hg, corresponding to not less than 98 per cent of $HgNH_2Cl$.

Description—Ammoniated Mercury occurs in white, pulverulent pieces or as a white, amorphous powder. It is odorless, and is stable in air, but is affected by light.

Solubility—Ammoniated Mercury is insoluble in water and in alcohol. It is readily soluble in warm hydrochloric, nitric, and acetic acids.

Identification—

A: One Gm. of Ammoniated Mercury is soluble in a cold solution of 5 Gm. of sodium thiosulfate in 5 cc. of water, with the evolution of ammonia. When this solution is heated for a short time, red mercuric sulfide is precipitated which, upon protracted boiling, turns black.

B: When heated with sodium hydroxide T.S., Ammoniated Mercury becomes yellow and ammonia is evolved.

C: A solution of Ammoniated Mercury in diluted nitric acid yields with potassium iodide T.S. a red precipitate, which is soluble in an excess of the reagent. The nitric acid solution yields a white precipitate with silver nitrate T.S.

Residue on ignition—When Ammoniated Mercury is strongly heated, it volatilizes, leaving not more than 0.2 per cent of residue.

Mercurous compounds—Ammoniated Mercury is completely soluble in warm hydrochloric acid.

Assay—Place about 400 mg. of Ammoniated Mercury, accurately weighed, in an Erlenmeyer flask, add 5 cc. of water and 5 cc. of acetic acid, and heat on a steam bath with frequent agitation until dissolved. Add 4 to 5 Gm. of zinc of between 10 and 40 mesh, cover the flask, and heat on a steam bath for 15 minutes with frequent agitation. Carefully decant the supernatant liquid without loss of any of the zinc, then wash the zinc by decantation with 25-cc. portions of water until the washings cease to give a reaction for chloride. Through a funnel inserted in the flask add, in small portions, 30 cc. of a mixture of equal volumes of nitric acid and water, allowing the reaction to subside before the next portion is added. Then heat gently until complete solution is effected, and rinse the funnel and the stem with some water, the rinsings going into the flask. Add 15 to 20 cc. of water and then add potassium permanganate T.S., in small portions, until a persistent pink color is produced. Discharge the pink color by the dropwise addition of oxalic acid T.S., cool the solution, add 2 cc. of ferric ammonium sulfate T.S. and 50 cc. of water, and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.03 mg. of Hg.

Packaging and storage—Preserve Ammoniated Mercury in well-closed, light-resistant containers.

Mercury, Ammoniated, Ointment

AMMONIATED MERCURY OINTMENT

Unguentum Hydrargyri Ammoniati

Ung. Hydrarg. Ammon.—White Precipitate Ointment

Ammoniated Mercury Ointment contains an amount of ammoniated mercury corresponding to not less than 3.5 per cent and not more than 4.5 per cent of Hg.

Ammoniated Mercury, in very fine powder..........	50 Gm.
Wool Fat..	50 Gm.
White Ointment....................................	900 Gm.
To make...........................	1000 Gm.

Levigate the ammoniated mercury with the wool fat to a smooth paste, and then incorporate with the white ointment (see page 2).

Assay—Place in a separator about 3 Gm. of Ammoniated Mercury Ointment, accurately weighed. Warm it slightly to soften the ointment and, while rotating, add 75 cc. of ether, and then shake the mixture until the ointment base is dissolved. Add 10 cc. of a mixture of equal volumes of hydrochloric acid and water and shake vigorously until all of the ammoniated mercury has dissolved. Filter the water layer that separates into a 250-cc. beaker and wash the remaining ether solution with several portions of 10 cc. each of water until the last washing produces no turbidity with silver nitrate T.S.

Dilute the hydrochloric acid solution and the combined washings to about 150 cc., add 5 cc. of hydrochloric acid, and precipitate with hydrogen sulfide gas. Collect the precipitate in a tared Gooch crucible and wash it successively with water, two 10-cc. portions of alcohol, two 10-cc. portions of carbon tetrachloride, using no suction, and finally wash with 10 cc. of ether. Dry the crucible and contents to constant weight at 100°. The weight of mercuric sulfide so obtained, multiplied by 0.862, represents the weight of Hg in the portion of the Ointment taken for the assay.

Mercury Oleate

MERCURY OLEATE

Oleatum Hydrargyri

Oleat. Hydrarg.

Mercury Oleate contains the equivalent of not less than 24 per cent and not more than 26 per cent of HgO.

Caution—Mercury Oleate must not be dispensed if globules of mercury have separated.

Yellow Mercuric Oxide, in very fine powder........	25 Gm.
Oleic Acid, a sufficient quantity,	
To make............................	100 Gm.

Mix the yellow mercuric oxide with 75 Gm. of oleic acid in a non-metallic vessel, warm the mixture to a temperature not exceeding 50°, stir constantly for 5 minutes, and then continue heating, stirring frequently, until the mercuric oxide is dissolved. Add sufficient oleic acid to make the product weigh 100 Gm., and mix thoroughly.

Description—Mercury Oleate is a yellowish brown, somewhat transparent substance, ointment-like in consistency, and having the odor of oleic acid. It is affected by light and is darkened by hydrogen sulfide.

Solubility—Mercury Oleate is slightly soluble in alcohol and in ether, and is readily soluble in fixed oils.

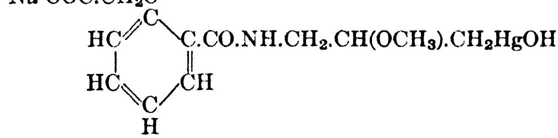
Assay—Accurately weigh about 750 mg. of Mercury Oleate on a small piece of paper. Transfer the paper and Oleate to a Kjeldahl flask of about 300-cc. capacity. Add 10 cc. of sulfuric acid, and heat on a water bath for 10 minutes, gently agitating the mixture at frequent intervals. Insert a small funnel in the neck of the flask, and slowly add 10 cc. of nitric acid. Heat the mixture with a Bunsen burner flame, at first gently, and then more strongly, until the solution is colorless or only slightly yellow, adding more nitric acid if necessary and keeping the funnel in the neck of the flask during heating. Allow the solution to cool sufficiently, and carefully add through the funnel about 30 cc. of water, rinsing the stem of the funnel with a few cc. of water and allowing the rinsings to run into the flask. Then to the warm solution add potassium permanganate T.S. until a slight pink color persists. Cool the solution, discharge its color by the addition of just sufficient oxalic acid T.S., add 50 cc. of water, 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.83 mg. of HgO.

Packaging and storage—Preserve Mercury Oleate in tight, light-resistant containers.

Mersalyl

MERSALYL

Mersalyl



$C_{13}H_{16}NO_6HgNa$ Mol. wt. 505.87

Mersalyl contains, when dried over sulfuric acid for 18 hours, not less than 38.5 per cent and not more than 40.5 per cent of Hg, corresponding to not less than 97 per cent of $C_{13}H_{16}HgNO_6Na$.

Description—Mersalyl occurs as a white or almost white, crystalline powder. It is odorless, and has a bitter taste. Mersalyl is somewhat deliquescent, and is gradually decomposed by light. Its solutions are alkaline to litmus paper.

Solubility—One Gm. of Mersalyl dissolves in about 1 cc. of water, and in about 2 cc. of alcohol. It is insoluble in chloroform and in ether.

Identification—

A: Dissolve about 500 mg. of Mersalyl in 5 cc. of water, add 5 cc. of formic acid, and boil the mixture under a reflux condenser for 15 minutes: a gray precipitate of metallic mercury is formed. Decant the hot solution through a small filter paper, allow the filtrate to cool, collect the separated crystals on a small filter, wash them four times with 5-cc. portions of cold water, allow to drain, and dry the crystals over sulfuric acid in a vacuum desiccator for 24 hours: the crystals melt between 119° and 122°.

B: The precipitate of metallic mercury obtained in *Identification test A*, when dissolved in a few drops of hot nitric acid, responds to the reactions for *Mercury*, page 661.

Loss on drying—When dried over sulfuric acid for 18 hours, Mersalyl loses not more than 7 per cent of its weight.

Chloride—Dissolve 100 mg. of Mersalyl in 5 cc. of water, add 2 drops of nitric acid, and filter through a small filter paper: the filtrate does not become opalescent immediately upon the addition of 2 drops of silver nitrate T.S.

Sulfate—Dissolve 100 mg. of Mersalyl in 5 cc. of water, add 2 drops of hydrochloric acid, and filter through a small filter paper: the filtrate does not become turbid immediately upon the addition of 2 drops of barium chloride T.S.

Mercury ions—Dissolve 500 mg. of Mersalyl in 10 cc. of water, and add 2 drops of sodium sulfide T.S.: no color is produced immediately.

Readily oxidizable substances—Dissolve 500 mg. of Mersalyl in 10 cc. of water, add 1 cc. of diluted sulfuric acid, filter through a small filter paper, and add 0.05 cc. of tenth-normal potassium permanganate to the filtrate: the mixture does not become decolorized immediately.

Assay for mercury—Place about 400 mg. of Mersalyl, previously dried over sulfuric acid for 18 hours and accurately weighed, in a Kjeldahl flask, add 10 cc. of sulfuric acid, insert a small, short-stemmed funnel into the neck of the flask, then add 10 cc. of nitric acid. Heat the mixture, at first gently, then more strongly, until the solution is colorless or only slightly yellow, adding more nitric acid if necessary, and keeping the funnel in the neck of the flask during the heating. Allow the solution to cool, and cautiously add through the funnel about 50 cc. of cold water. Rinse the funnel and the neck of the flask with a few cc. of water, receiving the rinsings in the flask. Add potassium permanganate T.S., dropwise, to the warm solution until a pink color persists, and discharge the pink color with the aid of just sufficient oxalic acid T.S., added dropwise. Cool the solution, add 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.03 mg. of Hg.

Packaging and storage—Preserve Mersalyl in tight, light-resistant containers.

Mersalyl and Theophylline Injection

MERSALYL AND THEOPHYLLINE INJECTION

Injectio Mersalylis et Theophyllinæ

Inj. Mersal. et Theophyll.

Mersalyl and Theophylline Injection is a sterile solution in water for injection of approximately 2 parts by weight of mersalyl ($C_{13}H_{16}NO_6Hg$-Na) to each 1 part by weight of theophylline ($C_7H_8N_4O_2.H_2O$). It con-

tains mercury (Hg) equivalent to not less than 37 per cent and not more than 42 per cent of the labeled amount of mersalyl ($C_{13}H_{16}NO_6HgNa$) and theophylline equivalent to not less than 93 per cent and not more than 107 per cent of the labeled amount of theophylline ($C_7H_8N_4O_2 \cdot H_2O$). It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Mersalyl and Theophylline Injection preferably by Process D. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—

A: To 5 cc. of Mersalyl and Theophylline Injection add 3 cc. of formic acid: a white precipitate is formed which, on being boiled, dissolves, leaving a gray residue of metallic mercury. Add 10 cc. of hot water to the mixture, filter through a small filter paper, and cool the filtrate. Collect the crystals on a small filter, wash them four times with 5-cc. portions of water, allow to drain, and dry the crystals over sulfuric acid for 24 hours: the crystals melt between 119° and 122°.

B: Combine the filtrate and washings from the crystals obtained in *test A*, and bubble hydrogen sulfide through the solution for 10 minutes. Filter, evaporate the filtrate to about 20 cc., and cool. Transfer to a small separator, add 10 Gm. of sodium acetate, and extract with three successive, 10-cc. portions of chloroform. Evaporate the combined chloroform extracts nearly to dryness, and dry over sulfuric acid for 24 hours: the residue melts between 270° and 274° and responds to *Identification test A* under *Theophylline*, page 565.

C: The precipitate of metallic mercury obtained in *test A*, when dissolved in a few drops of hot nitric acid, responds to the test for *Mercury*, page 661.

Reaction—One drop of Mersalyl and Theophylline Injection produces a blue color with 1 drop of bromothymol blue T.S., and a full yellow color with 1 drop of thymol blue pH indicator, corresponding to a pH of not less than 7.6 and not more than 8.0.

Mercury ion—To 5 cc. of Mersalyl and Theophylline Injection add 0.5 cc. of diluted acetic acid and 0.3 cc. of sodium sulfide T.S.: only a very faint coloration of the solution is noticeable immediately.

Assay for mercury—Transfer an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 200 mg. of mersalyl, into a Kjeldahl flask. Cautiously add 8 cc. of sulfuric acid, insert a small, short-stemmed funnel into the neck of the flask, and add 10 cc. of nitric acid. Heat the mixture, at first gently, then more strongly, until the solution is colorless or only slightly yellow, adding more nitric acid if necessary, and keeping the funnel in the neck of the flask during the heating. Allow the solution to cool, and cautiously add through the funnel about 50 cc. of cold water. Rinse the funnel and the neck of the flask with a few cc. of water, receiving the rinsings in the flask. Add potassium permanganate T.S., dropwise, to the warm solution until a slight pink color persists, and discharge the pink color with the aid of just sufficient oxalic acid T.S., added dropwise. Cool the solution, add 3 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.03 mg. of Hg.

Assay for theophylline—Transfer an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 200 mg. of theophylline, to a 200-cc. Erlenmeyer flask, add 1 cc. of sulfuric acid and 50 cc. of water, and bubble hydrogen sulfide through the

solution until no more precipitate is formed. Boil the solution gently until no more hydrogen sulfide is expelled, filter while hot, and wash the flask and filter with five 10-cc. portions of hot water. To the combined filtrate and washings add 5 Gm. of ammonium acetate and exactly 20 cc. of tenth-normal silver nitrate. Evaporate the mixture on a steam bath to a volume of about 50 cc., and filter through a filtering crucible while still warm. Wash the vessel and filter with three 10-cc. portions of hot water, add 5 cc. of nitric acid to the combined filtrate and washings, and allow to cool to room temperature. Titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 19.82 mg. of $C_7H_8N_4O_2.H_2O$.

Packaging and storage—Preserve Mersalyl and Theophylline Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Labeling—Mersalyl and Theophylline Injection must be labeled to indicate the amount each of mersalyl and of theophylline per cc. of the Injection.

Sizes—Mersalyl and Theophylline Injection usually available contains the following amounts of mersalyl and theophylline: Mersalyl—100 mg. (1½ grains) and Theophylline—50 mg. (¾ grain) in 1 cc.

AVERAGE DOSE OF MERSALYL AND THEOPHYLLINE—Intramuscular, an amount equivalent to:

Mersalyl	**0.2 Gm.**	(approximately 3 grains).
Theophylline	**0 1 Gm.**	(approximately 1½ grains).

Methacholine Chloride

METHACHOLINE CHLORIDE

Methacholinæ Chloridum

Methachol. Chlorid.—Acetyl-β-methylcholine Chloride

$C_8H_{18}ClO_2N$ $CH_3CO.OCH(CH_3)CH_2N(CH_3)_3.Cl$ Mol. wt. 195.69

Description—Methacholine Chloride occurs as colorless or white crystals, or as a white, crystalline powder. It is odorless or has a slight odor, and is very deliquescent. Its solutions are neutral to litmus paper.

Solubility—Methacholine Chloride is very soluble in water and freely soluble in alcohol and in chloroform.

Melting range—Methacholine Chloride melts between 170° and 173° when the capillary containing the Methacholine Chloride is previously dried at 110° for 3 hours.

Identification—

A: To about 100 mg. of Methacholine Chloride on a watch glass add 3 cc. of platinic chloride T.S. previously diluted with 2 cc. of water: small rhombohedric plates are formed (*difference from acetylcholine chloride which forms needles radiating from a central point, and from choline chloride which forms no crystals*).

B: To 1 cc. of a solution of Methacholine Chloride (1 in 10) add 1 cc. of alcohol and 1 cc. of sulfuric acid and heat gently: the odor of ethyl acetate becomes perceptible.

C: Add 2 Gm. of potassium hydroxide to 5 cc. of a solution of Methacholine Chloride (1 in 10) and heat gently: the odor of trimethylamine is evolved.

D: A solution of Methacholine Chloride (1 in 50) responds to the tests for *Chloride*, page 659.

Loss on drying—When dried for 4 hours at 110°, Methacholine Chloride loses not more than 1.5 per cent of its weight.

Residue on ignition—Methacholine Chloride yields not more than 0.1 per cent of residue on ignition, page 685.

Acetylcholine chloride—Add 3 cc. of a solution of sodium perchlorate (1 in 5) to 2 cc. of Methacholine Chloride solution (1 in 10), shake well, and immerse in ice water for 5 minutes: no precipitate is formed.

Per cent acetyl group—Weigh accurately about 500 mg. of Methacholine Chloride, previously dried at 110° for 4 hours, and dissolve it in 15 cc. of water in a small Erlenmeyer flask. Add 50 cc. of tenth-normal sodium hydroxide and heat on a steam bath for 45 minutes. Stopper the flask, allow to cool, and titrate the excess sodium hydroxide with tenth-normal sulfuric acid, using phenolphthalein T.S. as the indicator. Determine the normality of the tenth-normal sodium hydroxide in the same manner as in the test. It contains not less than 21.6 per cent and not more than 22.3 per cent of CH_3CO. Each cc. of tenth-normal sodium hydroxide is equivalent to 4.304 mg. of CH_3CO.

Per cent chlorine—Weigh accurately about 500 mg. of Methacholine Chloride, previously dried at 110° for 4 hours, and dissolve it in 30 cc. of water. Add 3 cc. of nitric acid, then add slowly, with agitation, 50 cc. of tenth-normal silver nitrate. Add 3 cc. of nitrobenzene, shake vigorously, and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. It contains not less than 17.8 per cent and not more than 18.4 per cent of chlorine (Cl). Each cc. of tenth-normal silver nitrate is equivalent to 3.546 mg. of Cl.

Packaging and storage—Preserve Methacholine Chloride in tight containers.

AVERAGE DOSE—Oral, **0.2 Gm.** (approximately 3 grains), Subcutaneous, **10 mg.** (approximately $\frac{1}{6}$ grain).

Methacholine Chloride Capsules

METHACHOLINE CHLORIDE CAPSULES

Capsulæ Methacholinæ Chloridi

Cap. Methachol. Chlorid.

Methacholine Chloride Capsules contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_8H_{18}ClO_2N$.

Identification—Digest a quantity of the contents of Methacholine Chloride Capsules, equivalent to about 100 mg. of methacholine chloride, with 20 cc. of chloroform in a stoppered flask at a temperature of about 45° to 50° for 15 minutes with frequent agitation. Decant the chloroform through a filter paper moistened with chloroform into a small beaker, and again extract the residue with another 20-cc. portion of chloroform in the same manner. Evaporate the combined chloroform extracts to dryness on a steam bath, then add to the residue 0.5 cc. of platinic chloride T.S., previously diluted with 0.5 cc. of water, and allow to stand for 10 minutes: small plate-like crystals are formed. Collect the crystals on a small filter, wash them with a small volume of dehydrated alcohol, and dry over sulfuric acid: the crystals so obtained melt between 220° and 225°.

Assay—Transfer as completely as possible the contents of a counted number of not less than 10 Methacholine Chloride Capsules to a 200-cc. volumetric flask. Place the emptied capsules in a beaker, add sufficient chloroform to cover them, and allow to stand with frequent agitation for 15 minutes. Filter into the flask, wash the beaker and filter with several 20-cc. portions of warm chloroform, receiving the washings in the same flask. Add to the flask sufficient chloroform to make about

150 cc., and digest at about 50° for 30 minutes with frequent agitation. Cool, add sufficient chloroform to make 200 cc., and mix well. Evaporate an accurately measured aliquot of the chloroform solution, equivalent to about 200 mg. of methacholine chloride, in a tared, glass-stoppered weighing bottle to dryness on a steam bath, dry the residue at 110° for 2 hours, cool in a desiccator, and weigh. The weight so obtained represents the quantity of $C_8H_{18}ClO_2N$ in the aliquot portion taken for the assay.

Dissolve the weighed residue in 10 cc. of water, and transfer the solution to a flask with the aid of 20 cc. of water. Add exactly 20 cc. of tenth-normal silver nitrate, then add 3 cc. of nitric acid and 3 cc. of nitrobenzene, shake vigorously, and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 19.57 mg. of $C_8H_{18}ClO_2N$. The quantity of $C_8H_{18}ClO_2N$ found by this titration corresponds to within 5 per cent above or below the quantity found by weight.

Packaging and storage—Preserve Methacholine Chloride Capsules in tight containers.

Sizes—Methacholine Chloride Capsules usually available contain the following amount of methacholine chloride: 0.2 Gm. (3 gr.)

AVERAGE DOSE OF METHACHOLINE CHLORIDE—**0.2 Gm.** (approximately 3 grains).

Methacholine Chloride Injection

METHACHOLINE CHLORIDE INJECTION

Injectio Methacholinæ Chloridi

Inj. Methachol. Chlorid.

Methacholine Chloride Injection is a sterile solution of methacholine chloride in water for injection. It contains not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_8H_{18}ClO_2N$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

The Injection may be buffered with sodium acetate, sodium citrate, or other suitable, harmless buffers.

Sterilize Methacholine Chloride Injection preferably by Process C, or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Evaporate a volume of Methacholine Chloride Injection, equivalent to about 50 mg. of methacholine chloride, to dryness in a small beaker on a steam bath. Add 15 cc. of hot chloroform to the residue, and stir with a glass rod for about 10 minutes, breaking up the residue with the rod. Filter through a filter paper moistened with chloroform, and again extract the residue with another 15 cc. of chloroform in the same manner as before. Evaporate the combined chloroform extracts to dryness on a steam bath, then add to the residue 0.5 cc. of platinic chloride T.S., previously diluted with 0.5 cc. of water, and allow to stand for 10 minutes. Small plate-like crystals are formed. Filter the crystals on a small filter, wash them with small volumes of dehydrated alcohol, and dry over sulfuric acid: the crystals so obtained melt between 220° and 225°.

Assay—Transfer an accurately measured volume of Methacholine Chloride Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 100 mg. of methacholine chloride, to a small beaker, evaporate to dryness on a steam bath, and dry the residue at 100° for 1 hour. Add to the residue 20 cc. of hot chloroform, and stir with a glass rod during 15 minutes, breaking up the residue with the rod. Decant the chloroform through a small filter paper moistened with chloroform. If an insoluble residue remains, again extract the residue three times with 15-cc. portions of hot chloroform in the same manner as before. Wash the beaker and filter with several 5-cc. portions of hot chloroform. Evaporate the combined chloroform solutions to dryness in a tared, glass-stoppered weighing bottle on a steam bath, dry the residue at 110° for 2 hours, cool in a desiccator, and weigh. The weight so obtained represents the quantity of $C_8H_{18}ClO_2N$ in the volume of the sample taken for the assay.

Dissolve the weighed residue in 10 cc. of water, and transfer the solution to a flask with the aid of 20 cc. of water. Add exactly 10 cc. of tenth-normal silver nitrate, then add 3 cc. of nitric acid and 3 cc. of nitrobenzene, shake vigorously, and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 19.57 mg. of $C_8H_{18}ClO_2N$. The quantity of $C_8H_{18}ClO_2N$ found by this titration corresponds to within 5 per cent above or below the quantity found by weight.

Packaging and storage—Preserve Methacholine Chloride Injection in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Sizes—Methacholine Chloride Injection usually available contains the following amount of methacholine chloride: 10 mg. (1/6 gr.) in 1 cc.

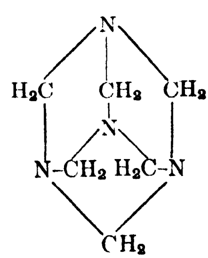
AVERAGE DOSE OF METHACHOLINE CHLORIDE—Subcutaneous, **10 mg.** (approximately 1/6 grain).

Methenamine

METHENAMINE

Methenamina

Methenam.—Hexamethylenamine, Hexamethylenetetramine



$C_6H_{12}N_4$ Mol. wt. 140.19

Methenamine, when dried over sulfuric acid for 4 hours, contains not less than 99 per cent of $C_6H_{12}N_4$.

Description—Methenamine occurs as colorless, lustrous crystals, or as a white, crystalline powder. It is practically odorless. When brought into contact with fire, it readily ignites, burning with a smokeless flame. It sublimes at about 260° without melting. Its solutions are alkaline to litmus paper.

Solubility—One Gm. of Methenamine dissolves in 1.5 cc. of water, in 12.5 cc. of alcohol, and in about 10 cc. of chloroform.

Identification—Heat a solution of Methenamine (1 in 10) with diluted sulfuric acid: it decomposes with the liberation of formaldehyde, which is recognized by its odor or by its darkening paper moistened with silver ammonium nitrate T.S. On the subsequent addition of an excess of solution of sodium hydroxide, ammonia is evolved.

Loss on drying—When dried over sulfuric acid for 4 hours, Methenamine loses not more than 2 per cent of its weight.

Residue on ignition—Methenamine yields not more than 0.05 per cent of residue on ignition, page 685.

Chloride—One Gm. of Methenamine shows no more *Chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—The addition of 5 drops of barium chloride T.S. to 10 cc. of a solution of Methenamine (1 in 50), acidulated with 5 drops of hydrochloric acid, produces no turbidity within 1 minute.

Ammonium salts—Add 1 cc. of alkaline mercuric potassium iodide T.S. to 10 cc. of a solution of Methenamine (1 in 20): the mixture is not darker in color than a mixture of 1 cc. of the reagent and 10 cc. of water.

Heavy metals—Dissolve 2 Gm. of Methenamine in 10 cc. of water, add 2 cc. of diluted hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Methenamine is 10 parts per million.

Assay—Weigh accurately about 1 Gm. of Methenamine, previously dried over sulfuric acid for 4 hours, place it in a beaker, add 40 cc. of normal sulfuric acid, and boil gently, adding water from time to time, if necessary, until the odor of formaldehyde is no longer perceptible. Cool, add 20 cc. of water, and titrate the excess of acid with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 35.05 mg. of $C_6H_{12}N_4$.

Packaging and storage—Preserve Methenamine in well-closed containers.

AVERAGE DOSE—**0.5 Gm.** (approximately 7½ grains).

Methenamine Tablets

METHENAMINE TABLETS

Tabellæ Methenaminæ

Tab. Methenam.

Methenamine Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_6H_{12}N_4$.

Identification—Dissolve about 500 mg. of powdered Methenamine Tablets in 10 cc. of water, add 10 cc. of diluted sulfuric acid, and heat: formaldehyde is liberated, recognizable by its odor and by its darkening paper moistened with silver ammonium nitrate T.S. On the subsequent addition of an excess of sodium hydroxide T.S., ammonia is liberated.

Assay—Weigh a counted number of not less than 20 Methenamine Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 1 Gm. of methenamine, and transfer it completely to a beaker. Add 40 cc. of normal sulfuric acid, and boil gently, adding water from time to time, if necessary, until the odor of formaldehyde is no longer perceptible. Cool, add 20 cc. of water, and titrate the excess of acid with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 35.05 mg. of $C_6H_{12}N_4$.

Packaging and storage—Preserve Methenamine Tablets in well-closed containers.
Sizes—Methenamine Tablets usually available contain the following amounts of methenamine: 0.3 and 0.5 Gm. (5 and 7½ grains).

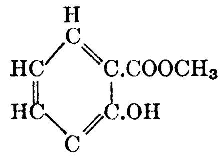
AVERAGE DOSE OF METHENAMINE—**0.5 Gm.** (approximately 7½ grains).

Methyl Salicylate

METHYL SALICYLATE

Methylis Salicylas

Methyl. Salicyl.—Gaultheria Oil, Wintergreen Oil, Betula Oil, Sweet Birch Oil



$C_8H_8O_3$ Mol. wt. 152.14

Methyl Salicylate is produced synthetically or is obtained by maceration and subsequent distillation with steam from the leaves of *Gaultheria procumbens* Linné (Fam. *Ericaceæ*) or from the bark of *Betula lenta* Linné (Fam. *Betulaceæ*). It contains not less than 98 per cent of $C_8H_8O_3$.

Description—Methyl Salicylate is a colorless, yellowish, or reddish liquid, having the characteristic odor and taste of gaultheria. It boils between 219° and 224° with some decomposition.
Solubility—Methyl Salicylate is slightly soluble in water, is soluble in alcohol, and in glacial acetic acid. It is soluble in about 7 volumes of 70 per cent alcohol, the solution having not more than a slight cloudiness.
Specific gravity—The specific gravity of Methyl Salicylate is not less than 1.180 and not more than 1.185 for the synthetic variety, and not less than 1.176 and not more than 1.182 for that prepared from gaultheria or from betula.
Optical rotation—Synthetic Methyl Salicylate and that from betula are optically inactive. Methyl salicylate from gaultheria is slightly lævorotatory and does not exceed −1.5° in a 100-mm. tube at 25°, page 675.
Refractive index—The refractive index of Methyl Salicylate is not less than 1.5350 and not more than 1.5380 at 20°, page 682.
Identification—Shake 1 drop of Methyl Salicylate with about 5 cc. of water, and add 1 drop of ferric chloride T.S.: the resulting mixture has a deep violet color.
Heavy metals—Methyl Salicylate meets the requirements of the test for *Heavy metals in volatile oils*, page 658.
Free acid—Shake 5 cc. of Methyl Salicylate with 25 cc. of freshly boiled and cooled water: the water layer separated from the Methyl Salicylate requires not more than 0.45 cc. of tenth-normal sodium hydroxide for neutralization, phenol red pH indicator being used as the indicator.
Assay—Place about 2 cc. of Methyl Salicylate, accurately weighed, in a tared flask, add 50 cc. of half-normal alcoholic potassium hydroxide, connect the flask with a reflux condenser, and heat the mixture on a water bath for 2 hours. Add a few drops of phenolphthalein T.S., and titrate the excess of alkali with half-normal hydrochloric acid. Determine the normality of the alcoholic potassium hydroxide

in the same manner as in the test. Each cc. of half-normal alcoholic potassium hydroxide corresponds to 76.07 mg. of $C_8H_8O_3$.

Packaging and storage—Preserve Methyl Salicylate in tight containers.

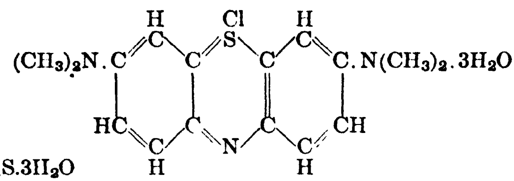
Labeling—Methyl Salicylate must be labeled to indicate whether it was made synthetically or distilled from either of the plants mentioned above.

Methylene Blue

METHYLENE BLUE

Cœruleum Methylenum

Cœr. Methylen.—Methylthionine Chloride U. S. P. XII



$C_{16}H_{18}ClN_3S.3H_2O$ Mol. wt. 373.89

Methylene Blue contains not less than 98.5 per cent of $C_{16}H_{18}ClN_3S$, calculated on a moisture-free basis.

Description—Methylene Blue occurs as dark green crystals or as a crystalline powder, having a bronze-like luster; odorless or having a slight odor. It is stable in air. Solutions of Methylene Blue have a deep blue color.

Solubility—One Gm. of Methylene Blue dissolves in about 25 cc. of water and in about 65 cc. of alcohol. It is soluble in chloroform.

Identification—

A: The addition of hydrochloric acid to a solution of Methylene Blue changes the color to a lighter shade of blue.

B: The addition of sodium hydroxide T.S. to a solution of Methylene Blue changes the color to a purplish shade, and if added in excess, produces, on standing, a precipitate having a dull violet color.

C: A solution of Methylene Blue in diluted sulfuric acid is gradually decolorized upon the addition of zinc dust.

Loss on drying—When dried for 18 hours, at 110°, Methylene Blue loses not more than 18 per cent of its weight.

Residue on ignition—Methylene Blue yields not more than 1.2 per cent of residue on ignition, page 685.

Arsenic—Intimately mix 200 mg. of Methylene Blue with about 500 mg. each of powdered potassium nitrate and anhydrous sodium carbonate, and heat the mixture in a crucible until the organic matter is completely oxidized. Dissolve the cooled residue in 15 cc. of diluted sulfuric acid, and evaporate the solution over a flame until the vapors of sulfuric acid begin to evolve: the residue so obtained meets the requirements of the test for *Arsenic*, page 618.

Copper or zinc—Ignite 1.0 Gm. of Methylene Blue in a porcelain crucible or dish at as low a temperature as practicable (450° to 600°) until all of the carbon is burned off. Add to the residue 15 cc. of diluted nitric acid and boil gently for 5 minutes. Filter, and wash any residue with 10 cc. of water. To the combined filtrates add an excess of ammonia T.S., and again filter through a small filter paper into a 50-cc. volumetric flask. Wash the precipitate with small quantities of water, collecting the washings in the flask, dilute to 50 cc. with water, and mix well. Add 10 cc. of hydrogen sulfide T.S. to 25 cc. of the solution: no turbidity is produced in 5

minutes (*zinc*). Any dark color produced is not darker than that produced by boiling a quantity of reagent cupric sulfate, equivalent to 0.2 mg. of copper (Cu), with 15 cc. of diluted nitric acid for 5 minutes, then treating it in the manner directed above for the sample being tested, beginning with "Filter and wash any residue with 10 cc. of water" (0.02 per cent Cu).

Assay—Place about 100 mg. of Methylene Blue, accurately weighed, in a 250-cc. beaker, dissolve, with stirring, in 70 cc. of water at a temperature of 70°, and allow the solution to cool. Add 30 cc. of a saturated solution of potassium perchlorate, and stir the mixture intermittently for 10 minutes. Filter the mixture through asbestos in a perforated crucible that has been dried at 110° and weighed. With the aid of a rubber-tipped glass rod transfer the precipitate remaining in the beaker to the crucible, using 50 cc. of methylthionine perchlorate T.S. Wash the precipitate and crucible with an additional 50 cc. of this solution, dry the crucible and precipitate for 1 hour at 110°, and weigh. The weight of the precipitate, multiplied by 0.8333, represents the weight of $C_{16}H_{18}ClN_3S$. Calculate the results on a moisture-free basis.

Packaging and storage—Preserve Methylene Blue in well-closed containers.

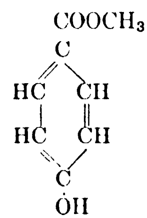
AVERAGE DOSE—**0.15 Gm.** (approximately 2½ grains).

Methylparaben

METHYLPARABEN

Methylparabenum

Methylparaben Methyl Parahydroxybenzoate



$C_8H_8O_3$ Mol. wt. 152.14

Methylparaben, when dried at 80° for 2 hours, contains not less than 99 per cent of $C_8H_8O_3$.

Description—Methylparaben occurs as small, colorless crystals, or as a white, crystalline powder. It is odorless or has a faint characteristic odor, and has a slight burning taste.

Solubility—One Gm. of Methylparaben is soluble in about 400 cc. of water, in about 2.4 cc. of alcohol, and in about 8 cc. of ether at 25°; it is soluble in 50 cc. of water at 80°; it is slightly soluble in benzene and in carbon tetrachloride.

Melting range—Methylparaben melts between 125° and 128°, page 667.

Identification—Dissolve 500 mg. of Methylparaben in 10 cc. of sodium hydroxide T.S. and boil for 30 minutes, allowing the solution to evaporate to a volume of about 5 cc. Cool, acidify the solution with diluted sulfuric acid, collect the crystals on a filter, wash them several times with small portions of water, and dry in a desiccator over sulfuric acid: the melting point of the liberated *p*-hydroxybenzoic acid is between 213° and 215°, page 667.

Residue on ignition—Methylparaben yields not more than 0.1 per cent of residue on ignition, page 685.

Free acid—Heat 500 mg. of Methylparaben in 10 cc. of water to 80°, cool, and filter: the filtrate is neutral or only slightly acid to litmus paper.

in the same manner as in the test. Each cc. of half-normal alcoholic potassium hydroxide corresponds to 76.07 mg. of $C_8H_8O_3$.

Packaging and storage—Preserve Methyl Salicylate in tight containers.

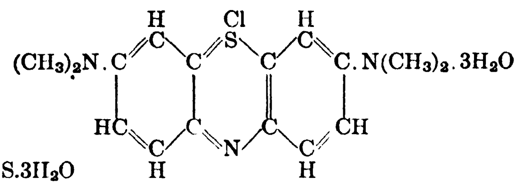
Labeling—Methyl Salicylate must be labeled to indicate whether it was made synthetically or distilled from either of the plants mentioned above.

Methylene Blue

METHYLENE BLUE

Cœruleum Methylenum

Cœr. Methylen.—Methylthionine Chloride U. S. P. XII



$C_{16}H_{18}ClN_3S.3H_2O$ Mol. wt. 373.89

Methylene Blue contains not less than 98.5 per cent of $C_{16}H_{18}ClN_3S$, calculated on a moisture-free basis.

Description—Methylene Blue occurs as dark green crystals or as a crystalline powder, having a bronze-like luster; odorless or having a slight odor. It is stable in air. Solutions of Methylene Blue have a deep blue color.

Solubility—One Gm. of Methylene Blue dissolves in about 25 cc. of water and in about 65 cc. of alcohol. It is soluble in chloroform.

Identification—

A: The addition of hydrochloric acid to a solution of Methylene Blue changes the color to a lighter shade of blue.

B: The addition of sodium hydroxide T.S. to a solution of Methylene Blue changes the color to a purplish shade, and if added in excess, produces, on standing, a precipitate having a dull violet color.

C: A solution of Methylene Blue in diluted sulfuric acid is gradually decolorized upon the addition of zinc dust.

Loss on drying—When dried for 18 hours, at 110°, Methylene Blue loses not more than 18 per cent of its weight.

Residue on ignition—Methylene Blue yields not more than 1.2 per cent of residue on ignition, page 685.

Arsenic—Intimately mix 200 mg. of Methylene Blue with about 500 mg. each of powdered potassium nitrate and anhydrous sodium carbonate, and heat the mixture in a crucible until the organic matter is completely oxidized. Dissolve the cooled residue in 15 cc. of diluted sulfuric acid, and evaporate the solution over a flame until the vapors of sulfuric acid begin to evolve: the residue so obtained meets the requirements of the test for *Arsenic*, page 618.

Copper or zinc—Ignite 1.0 Gm. of Methylene Blue in a porcelain crucible or dish at as low a temperature as practicable (450° to 600°) until all of the carbon is burned off. Add to the residue 15 cc. of diluted nitric acid and boil gently for 5 minutes. Filter, and wash any residue with 10 cc. of water. To the combined filtrates add an excess of ammonia T.S., and again filter through a small filter paper into a 50-cc. volumetric flask. Wash the precipitate with small quantities of water, collecting the washings in the flask, dilute to 50 cc. with water, and mix well. Add 10 cc. of hydrogen sulfide T.S. to 25 cc. of the solution: no turbidity is produced in 5

minutes (*zinc*). Any dark color produced is not darker than that produced by boiling a quantity of reagent cupric sulfate, equivalent to 0.2 mg. of copper (Cu), with 15 cc. of diluted nitric acid for 5 minutes, then treating it in the manner directed above for the sample being tested, beginning with "Filter and wash any residue with 10 cc. of water" (0.02 per cent Cu).

Assay—Place about 100 mg. of Methylene Blue, accurately weighed, in a 250-cc. beaker, dissolve, with stirring, in 70 cc. of water at a temperature of 70°, and allow the solution to cool. Add 30 cc. of a saturated solution of potassium perchlorate, and stir the mixture intermittently for 10 minutes. Filter the mixture through asbestos in a perforated crucible that has been dried at 110° and weighed. With the aid of a rubber-tipped glass rod transfer the precipitate remaining in the beaker to the crucible, using 50 cc. of methylthionine perchlorate T.S. Wash the precipitate and crucible with an additional 50 cc. of this solution, dry the crucible and precipitate for 1 hour at 110°, and weigh. The weight of the precipitate, multiplied by 0.8333, represents the weight of $C_{16}H_{18}ClN_3S$. Calculate the results on a moisture-free basis.

Packaging and storage—Preserve Methylene Blue in well-closed containers.

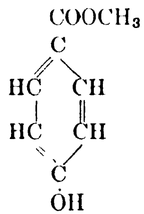
AVERAGE DOSE—**0.15 Gm.** (approximately 2½ grains).

Methylparaben

METHYLPARABEN

Methylparabenum

Methylparaben Methyl Parahydroxybenzoate



$C_8H_8O_3$ Mol. wt. 152.14

Methylparaben, when dried at 80° for 2 hours, contains not less than 99 per cent of $C_8H_8O_3$.

Description—Methylparaben occurs as small, colorless crystals, or as a white, crystalline powder. It is odorless or has a faint characteristic odor, and has a slight burning taste.

Solubility—One Gm. of Methylparaben is soluble in about 400 cc. of water, in about 2.4 cc. of alcohol, and in about 8 cc. of ether at 25°; it is soluble in 50 cc. of water at 80°; it is slightly soluble in benzene and in carbon tetrachloride.

Melting range—Methylparaben melts between 125° and 128°, page 667.

Identification—Dissolve 500 mg. of Methylparaben in 10 cc. of sodium hydroxide T.S. and boil for 30 minutes, allowing the solution to evaporate to a volume of about 5 cc. Cool, acidify the solution with diluted sulfuric acid, collect the crystals on a filter, wash them several times with small portions of water, and dry in a desiccator over sulfuric acid: the melting point of the liberated *p*-hydroxybenzoic acid is between 213° and 215°, page 667.

Residue on ignition—Methylparaben yields not more than 0.1 per cent of residue on ignition, page 685.

Free acid—Heat 500 mg. of Methylparaben in 10 cc. of water to 80°, cool, and filter: the filtrate is neutral or only slightly acid to litmus paper.

Chloride—Heat 2 Gm. of Methylparaben with 100 cc. of water, cool, add water to restore the original volume, and filter through cotton. To 50 cc. of the filtrate add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S.: no more turbidity is produced than in a control test using 0.5 cc. of fiftieth-normal hydrochloric acid.
Sulfate—To 10 cc. of the filtrate obtained in the test for *Chloride* add a few drops of diluted hydrochloric acid and a few drops of barium chloride T.S.: no turbidity is produced within 10 minutes.
Assay—Place about 2 Gm. of Methylparaben, previously dried at 80° for 2 hours and accurately weighed, in a flask, add 40 cc. of normal sodium hydroxide, and rinse the sides of the flask with water. Cover with a watch glass, boil gently for 1 hour, and cool. Add 5 drops of bromothymol blue T.S., and titrate the excess of sodium hydroxide with normal sulfuric acid to match the color of a buffer solution of pH 6.5 containing the same amount of indicator. The buffer solution contains 25 cc. of fifth-molar potassium biphosphate and 15.2 cc. of tenth-normal sodium hydroxide diluted to 100 cc. Determine the normality of the normal sodium hydroxide in the same manner as in the test. Each cc. of normal sodium hydroxide is equivalent to 152.14 mg. of $C_8H_8O_3$.
Packaging and storage—Preserve Methylparaben in tight containers.

Methylrosaniline Chloride

METHYLROSANILINE CHLORIDE

Methylrosanilinæ Chloridum

Methylrosanil. Chlorid.—Gentian Violet, Methyl Violet, Crystal Violet

Methylrosaniline Chloride is hexamethylpararosaniline chloride, usually admixed with pentamethylpararosaniline chloride and tetramethylpararosaniline chloride.

Description—Methylrosaniline Chloride occurs as a dark green powder or greenish glistening pieces having a metallic luster, and not more than a faint odor.
Solubility—One Gm. of Methylrosaniline Chloride dissolves in 30 cc. to 40 cc. of water, in about 10 cc. of alcohol, and in about 15 cc. of glycerin. It is soluble in chloroform, but insoluble in ether.
Identification—
A: Sprinkle about 1 mg. of Methylrosaniline Chloride on 1 cc. of sulfuric acid: it dissolves in the acid with an orange or brown red color. When this solution is diluted cautiously with water, the color changes to brown, then to green, and finally to blue.
B: Dissolve about 20 mg. of Methylrosaniline Chloride in 10 cc. of water and add 5 drops of hydrochloric acid. To 5 cc. of this solution add tannic acid T.S. drop by drop: a deep blue precipitate is produced.
C: To the remainder of the solution prepared for *test B* add about 500 mg. of zinc dust, and warm the mixture: rapid decolorization occurs. Place a drop of the decolorized solution adjacent to a drop of ammonia T.S. on a filter paper: the zone of contact assumes a blue color.
Loss on drying—When dried to constant weight at 110°, Methylrosaniline Chloride loses not more than 7.5 per cent of its weight.
Residue on ignition—Methylrosaniline Chloride yields not more than 1.5 per cent of residue on ignition, page 685.
Arsenic—Intimately mix 200 mg. of Methylrosaniline Chloride with about 500 mg. each of powdered potassium nitrate and anhydrous sodium carbonate, and heat the mixture in a crucible until the organic matter is completely oxidized. Dissolve the cooled residue in 15 cc. of diluted sulfuric acid, and evaporate the solution over

a flame until vapors of sulfuric acid begin to evolve: the residue so obtained meets the requirements of the test for *Arsenic*, page 618.

Lead—Place 1.0 Gm. of Methylrosaniline Chloride in a small Kjeldahl flask, add 5 cc. of sulfuric acid and insert a small funnel into the flask. Gently rotate the flask until the sulfuric acid has completely wetted the Methylrosaniline Chloride, then heat with a small flame until complete carbonization has taken place. Allow to cool, and add, in small quantities, 5 cc. of nitric acid. Again heat gently until fumes of sulfur trioxide are evolved. Allow to cool, add another 5 cc. of nitric acid, and again heat to the evolution of sulfur trioxide. Allow to cool, cautiously add about 25 cc. of water, and boil for a few minutes. After cooling, neutralize with stronger ammonia T.S., using litmus paper as the indicator, and add 5 cc. of nitric acid. Transfer the solution completely to a 100-cc. volumetric flask, dilute to 100 cc., and mix well. Use 20 cc. of this solution for the *Dithizone Test for Lead*, page 641. Perform a blank test with the same quantities of the same reagents, and make any necessary correction. Methylrosaniline Chloride contains not more than 30 parts per million of lead.

Alcohol-insoluble substances—Boil 1 Gm. of Methylrosaniline Chloride, accurately weighed, with 50 cc. of alcohol under a reflux condenser for 15 minutes, filter through a tared filtering crucible, wash the residue on the filter with hot alcohol until the washings cease to be colored violet, and dry the crucible to constant weight at 100°: the insoluble residue amounts to not more than 1 per cent.

Packaging and storage—Preserve Methylrosaniline Chloride in well-closed containers.

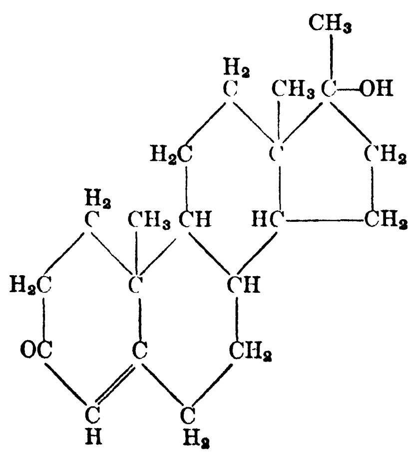
AVERAGE DOSE—**60 mg.** (approximately 1 grain).

Methyltestosterone

METHYLTESTOSTERONE

Methyltestosteronum

Methyltestost.



$C_{20}H_{30}O_2$ **Mol. wt. 302.44**

Description—Methyltestosterone occurs as white or slightly yellow crystals or crystalline powder. It is odorless and is stable in air. It is affected by light.

Solubility—Methyltestosterone is insoluble in water; it is soluble in alcohol, in methanol, in ether, and in other organic solvents, and sparingly soluble in vegetable oils.

Melting range—Methyltestosterone melts between 161° and 166°, page 667.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Methyltestosterone, determined in a solution in dioxane, containing in each 10 cc. 100 mg. of Methyltestosterone, previously dried over sulfuric acid for 4 hours, and using a 100-mm. tube, is not less than +69° and not more than +75°, page 675.

Identification—

A: Reflux 25 mg. of Methyltestosterone for 1 hour with 3.5 cc. of a methanol solution of hydroxylamine acetate, prepared by dissolving 50 mg. of hydroxylamine hydrochloride and 50 mg. of sodium acetate in 25 cc. of methanol. Precipitate the ketoxime with 15 cc. of water, filter, wash the precipitate, by suction, with water. Recrystallize the dried precipitate from 70 per cent methanol: the crystals, dried at 100°, melt between 210° and 216°.

B: The absorption coefficient of Methyltestosterone, measured in isopropanol solution, is log E = 4.21 at 2410 Ångströms, page 614.

Packaging and storage—Preserve Methyltestosterone in well-closed, light-resistant containers.

AVERAGE DOSE—Oral, **10 mg.** (approximately 1/6 grain).
Sublingual, **5 mg.** (approximately 1/12 grain).

Methyltestosterone Tablets

METHYLTESTOSTERONE TABLETS

Tabellæ Methyltestosteroni

Tab. Methyltestost.

Methyltestosterone Tablets contain not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{20}H_{30}O_2$.

Identification—Carefully evaporate the benzene solution obtained in the *Assay* to about 2 cc., add 20 cc. of petroleum benzin, collect the precipitated methyltestosterone on a filter, and dry: the crystals thus obtained melt between 161° and 165°.

Assay—Weigh a counted number of not less than 20 Methyltestosterone Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 100 mg. of methyltestosterone, in the thimble of a micro Soxhlet extractor. Extract with benzene for 6 hours. Transfer the contents of the extraction flask, quantitatively, to a 10-cc. volumetric flask, dilute to the mark at 20°, and using the sodium D-line and a 100-mm. tube, determine the optical rotation of this solution. Each 0.0864° is equivalent to 1 mg. of methyltestosterone.

Take one-half of the benzene solution (5 cc.) obtained above, evaporate to dryness, and transfer to a 5-cc. centrifuge tube with a minimum of methanol, and centrifuge. Evaporate the methanol solution to dryness and recrystallize from a minimum amount of 80 per cent methanol. Dry the crystals at 100°, and weigh: the recovery is not less than 75 per cent. The dried crystals melt between 161° and 166°. When a portion of the crystals is intimately mixed with an equal weight of U. S. P. methyltestosterone Reference Standard, the mixture melts at a temperature not more than 2° lower than the melting temperature of the Reference Standard.

Packaging and storage—Preserve Methyltestosterone Tablets in well-closed, light-resistant containers or in other suitable containers.

Sizes—Methyltestosterone Tablets usually available contain the following amounts of Methyltestosterone: 5 mg. ($\frac{1}{12}$ grain), 10 mg. ($\frac{1}{6}$ grain).

AVERAGE DOSE OF METHYLTESTOSTERONE—Oral, **10 mg.** (approximately $\frac{1}{6}$ grain). Sublingual, **5 mg.** (approximately $\frac{1}{12}$ grain).

Morphine Injection

MORPHINE INJECTION

Injectio Morphinæ

Inj. Morph.

Morphine Injection is a sterile solution of a suitable salt of morphine in water for injection. It contains not less than 93 per cent and not more than 107 per cent of the labeled amount of the morphine salt, the name of which must be stated on the label. A suitable preservative, not to exceed 0.5 per cent, may be added. It meets the requirements for *Sterility Tests for Liquids*, page 689.

Sterilize Morphine Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Render a suitable volume of the Injection alkaline with ammonia T.S. and extract with 25 cc. of the chloroform-alcohol solvent described in the *Assay*. The residue remaining when the extract is evaporated to dryness on a steam bath responds to *Identification tests B, C,* and *D* under *Morphine Sulfate*, page 330.

pH—The pH of Morphine Injection is not less than 4.3 and not more than 5.7.

Assay—Transfer an accurately measured volume of the *Injection* obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 100 mg. of morphine, to a separator, make alkaline with ammonia T.S., and extract the alkaloid completely by shaking the mixture first with 30 cc., then with successive 15-cc. portions of a mixture of 4 volumes of chloroform and 1 volume of alcohol. Wash the combined extracts with 5 cc. of water, and extract the water twice with 3-cc. portions of the chloroform-alcohol solvent. Filter the combined chloroform-alcohol extracts, and wash the separator and filter with two 5-cc. por-

tions of the solvent. Evaporate the solution nearly to dryness on a steam bath with the aid of a current of air, add exactly 25 cc. of fiftieth-normal sulfuric acid, and heat gently to dissolve the morphine and to expel the remaining chloroform. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 5.707 mg. of anhydrous morphine ($C_{17}H_{19}O_3N$), or 7.588 mg. of morphine sulfate [$(C_{17}H_{19}O_3N)_2.H_2SO_4.5H_2O$], or the equivalent quantity of any other morphine salt used.

Packaging and storage—Preserve Morphine Injection in hermetic or other suitable containers, protected from light. See *Containers for Injections*, page 630.

Sizes—*Morphine Injection usually available contains the following amounts of a morphine salt: 10 mg. (1/6 grain) in 1 cc.; 15 mg. (1/4 grain) in 1 cc.; 20 mg. (1/3 grain) in 1 cc.; 30 mg. (1/2 grain) in 1 cc.*

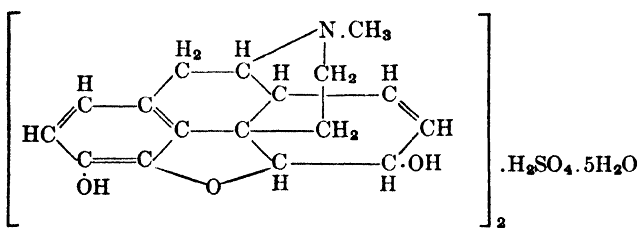
AVERAGE DOSE OF THE MORPHINE SALT, **10 mg.** (approximately 1/6 grain).

Morphine Sulfate

MORPHINE SULFATE

Morphinæ Sulfas

Morph. Sulf.



$(C_{17}H_{19}O_3N)_2.H_2SO_4.5H_2O$ Mol. wt. 758.82

Description—Morphine Sulfate occurs as white, feathery, silky crystals, as cubical masses of crystals, or as a white, crystalline powder. It is odorless and when exposed to air gradually loses water of hydration. It darkens on prolonged exposure to light.

Solubility—One Gm. of Morphine Sulfate dissolves in 16 cc. of water and in 570 cc. of alcohol. One Gm. dissolves in 1 cc. of water at 80° and in about 240 cc. of alcohol at 60°. It is insoluble in chloroform and in ether.

Identification—

A: Add a few drops of ammonia T.S. to 5 cc. of a solution of Morphine Sulfate (1 in 30), and gently shake the mixture: a white precipitate is formed, which dissolves upon the subsequent addition of a few cc. of sodium hydroxide T.S.

B: Sulfuric acid, containing 5 mg. of selenous acid in each cc., gives with Morphine Sulfate a blue color, changing to green and then to brown (*codeine* yields a green color, changing to blue and afterwards to grass green).

C: Sulfuric acid, containing 5 mg. of molybdenum trioxide in each cc., gives with Morphine Sulfate a purple color, changing to blue.

D: Sulfuric acid, containing in each cc. one drop of formaldehyde T.S., yields an intensely purple color with Morphine Sulfate.

E: Add potassium ferricyanide T.S., containing 1 drop of ferric chloride T.S. in

each cc., to a solution of Morphine Sulfate (1 in 100): a deep blue color is produced at once (difference from *codeine*).

F: A solution of Morphine Sulfate responds to the tests for *Sulfate*, page 663.

Residue on ignition—The residue on ignition from 500 mg. of Morphine Sulfate is negligible, page 685.

Limit of acidity—A solution of 500 mg. of Morphine Sulfate in 15 cc. of water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried at 130° for 4 hours, Morphine Sulfate loses not more than 12 per cent of its weight.

Meconate—Add a few drops of ferric chloride T.S. to 5 cc. of a solution of Morphine Sulfate (1 in 30), previously mixed with 5 cc. of diluted hydrochloric acid: no red color is produced.

Ammonium salts—Warm 200 mg. of Morphine Sulfate with 5 cc. of sodium hydroxide T.S.: the mixture does not evolve a noticeable odor of ammonia.

Foreign alkaloids—Dissolve 1.00 Gm. of Morphine Sulfate in 10 cc. of sodium hydroxide T.S. in a separator, and shake the solution with three successive portions of 15, 10, and 10 cc. of chloroform, passing the chloroform solutions through a small filter previously moistened with chloroform. Shake the combined chloroform solutions with 5 cc. of water, separate the chloroform, and evaporate it carefully to dryness on a water bath. Add to the residue thus obtained 10 cc. of fiftieth-normal sulfuric acid, heat gently until dissolved, cool, add 2 drops of methyl red T.S., and titrate the excess of acid with fiftieth-normal sodium hydroxide: not less than 7.5 cc. of the sodium hydroxide solution is required.

Packaging and storage—Preserve Morphine Sulfate in tight, light-resistant containers.

AVERAGE DOSE—**10 mg.** (approximately 1/6 grain).

Morphine Sulfate Tablets

MORPHINE SULFATE TABLETS

Tabellæ Morphinæ Sulfatis

Tab. Morph. Sulf.

Morphine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $(C_{17}H_{19}O_3N)_2.H_2SO_4.5H_2O$.

Identification—Powdered Morphine Sulfate Tablets respond to *Identification tests B, C, D, E,* and *F,* under *Morphine Sulfate*, page 630.

Assay—Weigh a counted number of not less than 20 Morphine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered Tablets, equivalent to about 120 mg. of morphine sulfate, and transfer it completely to a separator with the aid of 10 cc. of water. Add 2 drops of hydrochloric acid, then make the solution distinctly alkaline with ammonia T.S., and extract the alkaloid completely by shaking the mixture first with 30 cc., then with successive 15-cc. portions of a mixture of 4 volumes of chloroform and 1 volume of alcohol. Wash the combined extracts with 5 cc. of water, and extract the water twice with 3-cc. portions of the chloroform-alcohol solvent. Filter the combined chloroform-alcohol extracts, and wash the separator and filter with two 5-cc. portions of the solvent. Evaporate the solution nearly to dryness on a steam bath with the aid of a current of air, add to the residue exactly 25 cc. of fiftieth-normal sulfuric acid, and heat gently to dissolve the morphine and expel the remaining chloroform. Cool, and titrate the excess of acid with fiftieth-normal so-

dium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 7.588 mg. of $(C_{17}H_{19}O_3N)_2.H_2SO_4.5H_2O$.

NOTE—These identification tests and the assay are applicable to Morphine Sulfate Tablets for hypodermic use. If the tablets contain substances which may interfere with *Identification tests B, C, D,* and *E,* proceed as follows:

Digest a quantity of powdered Morphine Sulfate Tablets with 10 cc. of water acidified with 2 drops of hydrochloric acid, and filter. Render the filtrate alkaline with ammonia T.S., and extract with 25 cc. of the chloroform-alcohol solvent described in the assay. Evaporate the chloroform-alcohol solution to dryness on a steam bath, and use the residue for *Identification tests B, C, D,* and *E.*

For other than hypodermic tablets, a suitable modification of the assay given above may be necessary.

Packaging and storage—Preserve Morphine Sulfate Tablets in tight containers.

Sizes—Morphine Sulfate Tablets usually available contain the following amounts of morphine sulfate: 5, 8, 10, 15, and 30 mg. (1/12, 1/8, 1/6, 1/4, and 1/2 grain).

AVERAGE DOSE OF MORPHINE SULFATE—**10 mg.** (approximately 1/6 grain.)

Mucilages

Mustard, Black

BLACK MUSTARD

Sinapis Nigra

Sinap. Nig.—Brown Mustard

Black Mustard is the dried ripe seed of *Brassica nigra* (Linné) Koch or of *Brassica juncea* (Linné) Czerniaew, or of varieties of these species (Fam. *Cruciferæ*).

Black Mustard yields not less than 0.6 per cent of allyl isothiocyanate (C_3H_5NCS).

Description—

Unground Black Mustard—Spheroidal or irregularly spheroidal, from 1 to 1.6 mm. in diameter; testa dusky red to moderate yellowish brown, minutely pitted or reticulate; embryo dusky yellowish orange to moderate yellow, oily, with 2 large cotyledons; odor when dry, slight; on crushing and moistening, very irritating, strongly pungent, characteristic; taste strongly pungent, acrid.

Powdered Black Mustard—Light olive brown; consisting mostly of tissues of the embryo, the cells containing small aleurone grains and a fixed oil, the latter forming in large globules on the addition of chloral hydrate T.S.; fragments of seed-coat conspicuous, with large polygonal areas, enclosing small reddish orange to yellow stone cells, each of the latter with a dark lumen; few or no starch grains. In the preparation of powdered Black Mustard, a portion of its fixed oil and a portion of its seed-coat may be removed to facilitate the powdering.

Other seeds or other foreign organic matter—The amount of *other seeds* or other *Foreign organic matter* in Black Mustard does not exceed 5 per cent, pages 710 and 711.

Assay—Place 5 Gm. of Black Mustard, in powdered form, preferably coarse, in a 200-cc. flask, add 100 cc. of water, stopper tightly, and macerate for 2 hours at about 37°. Then add 20 cc. of alcohol, and distil about 70 cc. into a 100-cc. graduated flask containing 10 cc. of ammonia T.S. and 20 cc. of tenth-normal silver nitrate. Mix thoroughly, stopper the flask, allow the mixture to stand over night, then heat it in a bath of boiling water, cool, add water to make 100 cc. of mixture, and filter through a dry filter, rejecting the first portions of the filtrate. Acidify 50 cc. of the filtrate, representing 2.5 Gm. of Black Mustard, with about 5 cc. of nitric acid, and titrate the mixture with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 4.958 mg. of C_3H_5NCS.

AVERAGE DOSE—Emetic, **10 Gm.** (approximately 2½ drachms).

Mustard Plaster

MUSTARD PLASTER

Emplastrum Sinapis

Emp. Sinap.—Mustard Paper

Mustard Plaster is a uniform mixture of powdered black mustard, deprived of its fixed oil, and a solution of a suitable adhesive, spread on paper, cotton cloth, or other suitable backing material.

Each 100 square centimeters of spread plaster contains not less than 2.5 Gm. of black mustard which has been deprived of its fixed oil.

When moistened thoroughly with tepid water and applied to the skin, the Plaster produces a decided warmth and reddening of the skin within 5 minutes.

Packaging and storage—Preserve Mustard Plaster in well-closed containers, preferably at a temperature not above 35°. Protect it from direct sunlight.

Note—Before it is applied, Mustard Plaster should be thoroughly moistened with tepid water.

Myristica

MYRISTICA

Myristica

Myrist.—Nutmeg

Myristica is the dried ripe seed of *Myristica fragrans* Houttuyn (Fam. *Myristicaceæ*), deprived of its seed-coat and arillode and with or without a thin coating of lime.

Myristica yields not less than 25 per cent of non-volatile, ether-soluble extractive.

Description—

Unground Myristica—Ovoid or ellipsoidal, from 20 to 30 mm. in length and about

20 mm. in thickness; externally light brown to dark brown; reticulately furrowed, the broad end with a large, circular, upraised scar from which arises a raphe extending to a depression at the opposite end; the cut surface having a waxy luster and a mottled appearance, given by the dark perisperm and the lighter colored endosperm; odor characteristically aromatic, taste pungently aromatic.

Histology—Perisperm thin, reddish brown to yellowish orange, penetrating by many wavy branches or folds into the yellowish brown endosperm and forming with it ruminate albumen; embryo small and more or less shrunken, in an irregular cavity near the base.

Powdered Myristica—Brown to moderate yellowish brown; consisting of irregular fragments; perisperm with large, circular or elliptical volatile-oil reservoirs, small thin-walled parenchyma cells with reddish orange to orange or brown contents and occasional spiral tracheæ; endosperm with more or less polygonal parenchyma cells containing starch, large aleurone grains, fat, and occasionally brown to yellowish orange pigment; fixed oil globules numerous; starch grains single or 2- to 3-compound, or in aggregates, the individual grains, spherical, planoconvex or polygonal, from 3 to 22 microns in diameter, with a distinct, sometimes cleft hilum.

Acid-insoluble ash—Myristica yields not more than 0.5 per cent of *Acid-insoluble ash*, pages 710 and 711.

Assay—Proceed as directed under *Non-volatile, ether-soluble extractive*, pages 710 and 714.

Myristica Oil

MYRISTICA OIL

Oleum Myristicæ

Ol. Myrist.—Nutmeg Oil, East Indian Nutmeg Oil, West Indian Nutmeg Oil

Myristica Oil is the volatile oil distilled with steam from the dried kernels of the ripe seed of *Myristica fragrans* Houttuyn (Fam. *Myristicaceæ*).

Description—Myristica Oil is a colorless or pale yellow liquid having the characteristic odor and taste of nutmeg.

Solubility—Myristica Oil, East Indian, is soluble in an equal volume of alcohol, and in 3 volumes of 90 per cent alcohol.

Myristica Oil, West Indian, is soluble in 4 volumes of 90 per cent alcohol.

Specific gravity—The specific gravity of Myristica Oil is not less than 0.880 and not more than 0.910 for East Indian Oil, and not less than 0.854 and not more than 0.880 for West Indian Oil.

Optical rotation—The optical rotation of Myristica Oil is not less than +10° and not more than +30° for East Indian Oil, and not less than +30° and not more than +50° for West Indian Oil, in a 100-mm. tube, page 675.

Refractive index—The refractive index of Myristica Oil is not less than 1.4740 and not more than 1.4880 for East Indian Oil and not less than 1.4690 and not more than 1.4760 for West Indian Oil, at 20°, page 682.

Reaction—A solution of recently distilled Myristica Oil, East Indian, in an equal volume of alcohol, or of Myristica Oil, West Indian, in 4 volumes of 90 per cent alcohol, is neutral to moistened litmus paper.

Residue on evaporation—Evaporate 3 cc. of Myristica Oil in a small tared dish on a water bath: the weight of the residue does not exceed 60 mg. for East Indian Oil, and 50 mg. for West Indian Oil.

Packaging and storage—Preserve Myristica Oil in tight containers.

Labeling—Myristica Oil must be labeled to indicate whether it is East Indian or West Indian Oil.

Myrrh

MYRRH

Myrrha

Myrrh.—Gum Myrrh

Myrrh is an oleo-gum-resin obtained from *Commiphora molmol* Engler, *Commiphora abyssinica* (Berg) Engler or from other species of *Commiphora* (Fam. *Burseraceæ*).

Myrrh yields not less than 30 per cent of alcohol-soluble extractive.

Description—

Unground Myrrh—Rounded or irregular tears or masses of agglutinated tears, moderate yellow to dark or reddish brown and more or less covered with a lighter colored yellowish dust; fracture waxy, granular, conchoidal; internally yellowish or reddish brown, sometimes marked with nearly white spots or lines, oily, translucent at the edges; odor balsamic, aromatic, not terebinthinate; taste aromatic, bitter, and acrid.

Powdered Myrrh—Weak yellowish orange to strong yellowish brown; consisting of numerous angular fragments of resin and gum, a few fragments of lignified tissue and a very few starch grains.

Acid-insoluble ash—Myrrh yields not more than 5 per cent of *Acid-insoluble ash*, pages 710 and 711.

Identification—

A: Myrrh becomes purplish to violet when treated with nitric acid.

B: An ether solution of Myrrh becomes reddish violet when treated with bromine vapor.

C: When triturated with water, Myrrh forms a yellowish brown emulsion.

Assay—Proceed as directed under *Alcohol-soluble extractive*, pages 710 and 714.

Myrrh Tincture

MYRRH TINCTURE

Tinctura Myrrhæ

Tr. Myrrh.

MYRRH, in moderately coarse powder..................	200 Gm.
To make..........................	1000 cc.

Prepare a tincture by Process M, page 708, using alcohol as the menstruum.

Packaging and storage—Preserve Myrrh Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol content—From 83 to 88 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—2 cc. (approximately 30 minims).

Neoarsphenamine

NEOARSPHENAMINE

Neoarsphenamina

Neoarsphen.

Neoarsphenamine consists chiefly of sodium 3,3′-diamino-4,4′-dihydroxyarsenobenzene-N-methanal sulfoxylate. It contains not less than 19 per cent of arsenic (As).

Neoarsphenamine must be prepared in an establishment licensed for the purpose by the United States Government upon recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being offered for sale must comply with the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Caution—Solutions of Neoarsphenamine must be freshly prepared when required for use. The solution should not be shaken during its preparation.

Description—Neoarsphenamine occurs as a yellow powder. It is odorless or has a slight odor. Its solutions are neutral or slightly alkaline to litmus paper. In the dry state or in solution, it is readily oxidized by exposure to the air, becoming darker and more toxic. Higher temperatures accelerate the oxidation.

Solubility—Neoarsphenamine is very soluble in water. It is soluble in glycerin, slightly soluble in alcohol, and almost insoluble in dehydrated alcohol, in chloroform, and in ether.

Identification—

A: Mix 0.5 cc. of diluted hydrochloric acid with 20 cc. of a solution of Neoarsphenamine (1 in 100): a heavy precipitate is produced within 1 minute.

B: The addition of 2 drops of freshly prepared ferric chloride T.S. to 5 cc. of a solution of Neoarsphenamine (1 in 1000) produces a purple or purplish red color, changing to dark red.

C: To 10 cc. of a solution of Neoarsphenamine (1 in 100) add 10 cc. of diluted hydrochloric acid, and heat: the odor of sulfur dioxide is perceptible.

D: The solution resulting from the *Assay for arsenic* yields with hydrogen sulfide a yellow precipitate which is soluble in ammonium carbonate T.S.

Loss on drying—When dried for 24 hours in a vacuum desiccator over fresh phosphorus pentoxide, Neoarsphenamine loses not more than 1.5 per cent of its weight.

Completeness of solubility—Add 600 mg. of Neoarsphenamine to 3 cc. of water in a test tube or small cylinder, and gently rotate the mixture: a complete solution results in 5 minutes.

Assay for arsenic—Place about 200 mg. of Neoarsphenamine, accurately weighed, in a glass-stoppered, 200- to 300-cc. flask. Add 1 Gm. of finely powdered potassium permanganate and 5 cc. of diluted sulfuric acid, and allow to stand for 10 minutes, rotating the contents of the flask during this time to insure thorough mixing. Cautiously add 10 cc. of sulfuric acid in portions of about 2 cc., rotating the flask after each addition. When the reaction has ceased, add sufficient hydrogen peroxide T.S. to dissolve completely the brown precipitate (about 5 to 7 cc.). Toward the end of the reaction the hydrogen peroxide T.S. is to be added dropwise to avoid any great excess. Dilute with 25 cc. of water, and boil gently over an asbestos-wire gauze for 15 to 20 minutes, or until the excess of hydrogen peroxide is expelled. Dilute with 50 cc. of water, and add tenth-normal potassium permanganate until the liquid is faintly pink, then discharge the pink color by the addition of a drop of tenth-normal oxalic acid. Cool the solution, add 2.5 Gm. of potassium iodide,

stopper the flask tightly, and allow it to stand in a cool, dark place for 1 hour. Then titrate the liberated iodine with tenth-normal sodium thiosulfate without the use of starch indicator. Perform a blank test with the same quantities of reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 3.746 mg. as As.

Packaging and storage—Preserve Neoarsphenamine at a temperature preferably not above 25° in hermetic containers of colorless glass, from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the amount in grams or milligrams of the Neoarsphenamine contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label on the outside of the container of one or more ampuls must bear the official title, the amount in grams or milligrams of the Neoarsphenamine contained in the individual ampul, the lot number of the product, the name and address of the manufacturer, the U. S. license number of the manufacturer, and the expiration date for the product.

The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its stability) shall not be more than 3 years from the date of release of that lot by the National Institute of Health.

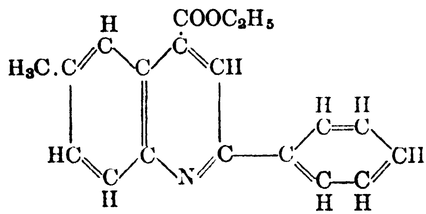
AVERAGE DOSE—Intravenous, **0.45 Gm.** (approximately 7 grains).

Neocinchophen

NEOCINCHOPHEN

Neocinchophenum

Neocinchophen.



$C_{19}H_{17}O_2N$ Mol. wt. 291.33

Description—Neocinchophen is a white to pale yellow, crystalline powder. It is odorless and tasteless, is permanent in air, but is affected by light.

Solubility—Neocinchophen is nearly insoluble in water, is soluble in hot alcohol, and is very soluble in ether and in chloroform.

Melting temperature—Neocinchophen melts at a temperature not below 74°, page 667.

Identification—

A: Boil 100 mg. of Neocinchophen with 1 cc. of sodium hydroxide T.S., and add 5 cc. of iodine T.S.: the odor of iodoform is apparent.

B: Dissolve 100 mg. of Neocinchophen in 1 cc. of sulfuric acid, and add an excess of bromine T.S., drop by drop: a yellow precipitate is produced.

C: Add a few drops of ferric chloride T.S. to 5 cc. of an alcohol solution of Neocinchophen (1 in 100): a yellow color is produced. (Cinchophen produces a reddish brown color.)

Loss on drying—When dried over sulfuric acid for 4 hours, Neocinchophen loses not more than 2 per cent of its weight.

Residue on ignition—Neocinchophen yields not more than 0.1 per cent of residue on ignition, page 685.

Cinchophen—Warm about 500 mg. of Neocinchophen with 10 cc. of ammonia T.S., filter, and exactly neutralize the filtrate with hydrochloric acid: no precipitate is produced.

Packaging and storage—Preserve Neocinchophen in well-closed, light-resistant containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Neocinchophen Tablets

NEOCINCHOPHEN TABLETS

Tabellæ Neocinchopheni

Tab. Neocinchophen.

Neocinchophen Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $C_{19}H_{17}O_2N$.

Identification—Triturate a quantity of finely powdered Neocinchophen Tablets, equivalent to about 1 Gm. of neocinchophen, with two 10-cc. portions of petroleum benzin, and discard the latter. Macerate the residue with 50 cc. of ether for 10 minutes, filter, evaporate the filtrate at a temperature not above 40°, and dry at about 60°. The residue of neocinchophen so obtained does not melt below 74°, and responds to *Identification tests A* and *B* under *Neocinchophen*, page 337.

Cinchophen—Warm about 250 mg. of the residue of neocinchophen obtained in the preceding test with 5 cc. of ammonia T.S., filter, and neutralize the filtrate with diluted hydrochloric acid: no precipitate is formed.

Assay—Weigh a counted number of not less than 20 Neocinchophen Tablets, and reduce them to a fine powder without appreciable loss. Heat an accurately weighed portion of the powder, equivalent to about 2 Gm. of neocinchophen, under a reflux condenser for 15 minutes with 50 cc. of alcohol, then decant while hot through a filter into a 200-cc. volumetric flask. Heat the undissolved residue again with 50 cc. of alcohol for 15 minutes, and filter while hot. Transfer the residue to the filter with the aid of hot alcohol, and wash it with small portions of alcohol until the total volume is about 180 cc. Cool quickly, add alcohol to the 200-cc. mark, and mix. Transfer exactly 50 cc. of the solution to an Erlenmeyer flask, add exactly 40 cc. of tenth-normal alcoholic potassium hydroxide, and boil under a reflux condenser for 1 hour. Cool, and titrate the excess of potassium hydroxide with tenth-normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Determine the normality of the tenth-normal potassium hydroxide by mixing 40 cc. of it with 50 cc. of the same alcohol, heating the solution in the same manner as the sample, and titrating with tenth-normal hydrochloric acid, using phenolphthalein T.S. as indicator.

Titrate another 50-cc. portion of the alcohol extract of the Tablets with tenth-normal alcoholic potassium hydroxide, using phenolphthalein T.S. as the indicator. The difference between the volume of tenth-normal alcoholic potassium hydroxide consumed in the saponification and in this titration, multiplied by 29.13, represents the weight in milligrams of neocinchophen in one-fourth of the weight of the Tablets taken for the assay.

Packaging and storage—Preserve Neocinchophen Tablets in well-closed containers.

Sizes—Neocinchophen Tablets usually available contain the following amounts of neocinchophen: 0.3 and 0.5 Gm. (5 and 7½ grains).

AVERAGE DOSE OF NEOCINCHOPHEN—**0.3 Gm.** (approximately 5 grains).

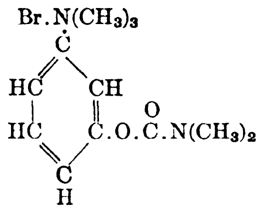
Neostigmine Bromide

NEOSTIGMINE BROMIDE

Neostigminæ Bromidum

Neostig. Bromid.

$C_{12}H_{19}BrN_2O_2$



Mol. wt. 303.20

Neostigmine Bromide, when dried at 100° for 3 hours, contains not less than 98 per cent of $C_{12}H_{19}BrN_2O_2$.

Description—Neostigmine Bromide is a white, crystalline powder. It is odorless, and has a bitter taste. Its solutions are neutral to litmus paper. It melts with decomposition at about 167°, page 667.

Solubility—One Gm. of Neostigmine Bromide dissolves in about 1 cc. of water. It is soluble in alcohol. It is practically insoluble in ether.

Identification—

A: Place about 1 mg. of Neostigmine Bromide in a small porcelain dish, add 2 cc. of water and 0.5 cc. of a solution of sodium hydroxide (2 in 5), and evaporate to dryness on a water bath. Then transfer the residue to a small test tube, and quickly heat in an oil bath to 250°, continuing at that temperature for about 30 seconds. Cool, and dissolve the residue in 0.5 cc. of water, cool again in ice water, and add 1 cc. of diazobenzenesulfonic acid T.S.: a cherry red color is produced.

B: A solution of Neostigmine Bromide (1 in 50) responds to the identification test for *Bromide*, page 659.

Loss on drying—When dried at 100° for 3 hours, Neostigmine Bromide loses not more than 2 per cent of its weight.

Residue on ignition—Neostigmine Bromide yields not more than 0.15 per cent of residue on ignition, page 685.

Sulfate—Dissolve 250 mg. of Neostigmine Bromide in 10 cc. of water, add 1 cc. of diluted hydrochloric acid, and 1 cc. of barium chloride T.S.: no turbidity is produced immediately.

Assay—Place about 350 mg. of Neostigmine Bromide, previously dried at 100° for 3 hours and accurately weighed, in a 500-cc. Kjeldahl flask, dissolve in 200 cc. of water, and add 50 cc. of a solution of sodium hydroxide (1 in 10). Connect the flask

by means of a distillation trap to a well-cooled condenser which dips into a vessel containing 25 cc. of tenth-normal sulfuric acid, accurately measured. Distil about 200 cc. of the contents of the flask, then add about 5 drops of methyl red T.S. to the liquid in the receiving vessel, and titrate the excess of acid with tenth-normal sodium hydroxide. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 30.32 mg. of $C_{12}H_{19}BrN_2O_2$.

Packaging and storage—Preserve Neostigmine Bromide in tight containers.

AVERAGE DOSE—Oral, **15 mg.** (approximately ¼ grain).

Neostigmine Bromide Tablets

NEOSTIGMINE BROMIDE TABLETS

Tabellæ Neostigminæ Bromidi

Tab. Neostig. Bromid.

Neostigmine Bromide Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $C_{12}H_{19}BrN_2O_2$.

Identification—Triturate a quantity of powdered Neostigmine Bromide Tablets, equivalent to about 300 mg. of neostigmine bromide, with three 5-cc. portions of ether, and discard the ether. Macerate the residue with several 10-cc. portions of alcohol, filtering after each maceration. Evaporate the combined alcohol filtrates on a steam bath, and dry the residue at about 80°. The residue of neostigmine bromide so obtained melts at about 167°, with decomposition, and responds to *Identification tests A* and *B* under *Neostigmine Bromide*, page 339.

Assay—Weigh a counted number of not less than 20 Neostigmine Bromide Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 300 mg. of neostigmine bromide, and macerate it for 15 minutes with 20 cc. of 70 per cent alcohol containing 1 cc. of diluted hydrochloric acid in each 100 cc. Decant the alcohol through a small filter, and extract the residue by maceration with three successive portions of 15 cc. each of 70 per cent alcohol. Finally transfer the residue completely to the filter, and wash it with a few 5-cc. portions of alcohol. Evaporate the combined alcohol filtrates to about 10 cc., and completely transfer the residual solution by means of small portions of alcohol to a Kjeldahl flask. Add 200 cc. of water and 50 cc. of sodium hydroxide solution (1 in 10), and connect the flask by means of a distillation trap to a well-cooled condenser which dips into a vessel containing exactly 25 cc. of tenth-normal sulfuric acid. Distil about 200 cc. of the contents of the flask, then add about 5 drops of methyl red T.S. to the liquid in the receiving vessel, and titrate the excess of acid with tenth-normal sodium hydroxide. Perform a blank test with the same quantities of reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal acid is equivalent to 30.32 mg. of $C_{12}H_{19}BrN_2O_2$.

Packaging and storage—Preserve Neostigmine Bromide Tablets in tight containers.

Sizes—Neostigmine Bromide Tablets usually available contain the following amount of neostigmine bromide: 15 mg. (¼ grain).

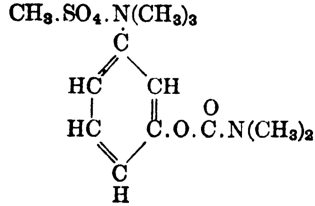
AVERAGE DOSE OF NEOSTIGMINE BROMIDE—**15 mg.** (approximately ¼ grain).

NEOSTIGMINE METHYLSULFATE

Neostigminæ Methylsulfas

Neostig. Methylsulf.

$C_{13}H_{22}N_2O_6S$



Mol. wt. 334.38

Neostigmine Methylsulfate, when dried at 100° for 3 hours, contains not less than 98 per cent of $C_{13}H_{22}N_2O_6S$.

Description—Neostigmine Methylsulfate is a white, crystalline powder. It is odorless, and has a bitter taste. Its solutions are neutral to litmus paper.

Solubility—One Gm. of Neostigmine Methylsulfate dissolves in about 10 cc. of water. It is less soluble in alcohol.

Melting range—Neostigmine Methylsulfate melts between 142° and 145°, page 667.

Identification—

A: Place about 1 mg. of Neostigmine Methylsulfate in a small porcelain dish, add 2 cc. of water and 0.5 cc. of a solution of sodium hydroxide (2 in 5), and evaporate to dryness on a water bath. Transfer the residue to a small test tube, and quickly heat in an oil bath to 250°, continuing at that temperature for about 30 seconds. Cool, and dissolve the residue in 0.5 cc. of water, cool again in ice water, and add 1 cc. of diazobenzenesulfonic acid T.S.: a cherry red color is produced.

B: Intimately mix about 20 mg. of Neostigmine Methylsulfate with 500 mg. of sodium carbonate, and heat the mixture to fusion in a small crucible. Boil the fused mass with 10 cc. of water until disintegrated, and filter. Add a few drops of bromine T.S. to the filtrate, heat to boiling, acidify with hydrochloric acid, and expel the excess of bromine by boiling: the resulting solution responds to the identification test for *Sulfate*, page 663.

Loss on drying—Dry about 300 mg. of Neostigmine Methylsulfate, accurately weighed, at 100° for 3 hours: it loses not more than 1 per cent of its weight.

Residue on ignition—Neostigmine Methylsulfate yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—To 10 cc. of a solution of Neostigmine Methylsulfate (1 in 50), add 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S.: no opalescence results immediately.

Sulfate ion—To 10 cc. of a solution of Neostigmine Methylsulfate (1 in 50), add 1 cc. of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no turbidity results immediately.

Assay—Place about 350 mg. of Neostigmine Methylsulfate, previously dried at 100° for 3 hours and accurately weighed, in a 500-cc. Kjeldahl flask, dissolve in 200 cc. of water, and add 50 cc. of a solution of sodium hydroxide (1 in 10). Connect the flask by means of a distillation trap to a well-cooled condenser which dips into a vessel containing 25 cc. of tenth-normal sulfuric acid. Distil about 200 cc. of the contents of the flask, and titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Perform a blank test with the same quantities of the reagents and in the same manner, and make any necessary

correction. Each cc. of tenth-normal sulfuric acid is equivalent to 33.44 mg. of $C_{13}H_{22}N_2O_6S$.

Packaging and storage—Preserve Neostigmine Methylsulfate in tight containers.

AVERAGE DOSE—Subcutaneous or intramuscular, **0.5 mg.** (approximately $\frac{1}{120}$ grain).

Neostigmine Methylsulfate Injection

NEOSTIGMINE METHYLSULFATE INJECTION

Injectio Neostigminæ Methylsulfatis

Inj. Neostig. Methylsulf.

Neostigmine Methylsulfate Injection is a sterile solution of neostigmine methylsulfate in water for injection. It contains not less than 90 per cent and not more than 110 per cent of the labeled amount of $C_{13}H_{22}N_2O_6S$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Neostigmine Methylsulfate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Evaporate, if necessary, a volume of the Injection to a concentration of 1 mg. in 2 cc., then place the liquid in a small porcelain dish, add 0.5 cc. of a solution of sodium hydroxide (2 in 5), and proceed as directed in the *Identification tests* under *Neostigmine Methylsulfate*, page 341.

Assay—Place an accurately measured volume of Neostigmine Methylsulfate Injection, equivalent to at least 30 mg. of neostigmine methylsulfate, in a 500-cc. Kjeldahl flask, add 200 cc. of water and 50 cc. of sodium hydroxide solution (1 in 10), and proceed as directed in the *Assay* for *Neostigmine Methylsulfate*, page 341, beginning with "Connect the flask," but using 15 cc. of fiftieth-normal sulfuric acid and titrating with fiftieth-normal sodium hydroxide. Each cc. of fiftieth-normal sulfuric acid is equivalent to 6.688 mg. of $C_{13}H_{22}N_2O_6S$.

Packaging and storage—Preserve Neostigmine Methylsulfate Injection preferably in single-dose, hermetic containers or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light.

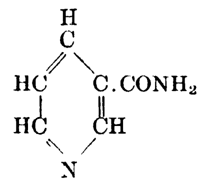
Sizes—Neostigmine Methylsulfate Injection usually available contains the following amounts of neostigmine methylsulfate: 1 cc. of 1:4000 solution = 0.25 mg. ($\frac{1}{250}$ grain); 1 cc. of 1:2000 solution = 0.5 mg. ($\frac{1}{120}$ grain).

AVERAGE DOSE OF NEOSTIGMINE METHYLSULFATE—Subcutaneous or intramuscular, **0.5 mg.** (approximately $\frac{1}{120}$ grain).

NICOTINAMIDE

Nicotinamidum

Nicotinamid.—Nicotinic Acid Amide, Niacinamide

$C_6H_6N_2O$  Mol. wt. 122.12

Nicotinamide, when dried over sulfuric acid for 4 hours, contains not less than 98.5 per cent of $C_6H_6N_2O$.

Description—Nicotinamide is a white, crystalline powder. It is odorless or nearly so, and has a bitter taste. Its solutions are neutral to litmus paper.

Solubility—One Gm. of Nicotinamide dissolves in about 1 cc. of water, in about 1.5 cc. of alcohol, and in about 10 cc. of glycerin.

Melting range—Nicotinamide melts between 128° and 131°, page 667.

Identification—

A: To the solution remaining in the distilling flask following the completion of the *Assay*, add diluted sulfuric acid until the solution has a faintly acid reaction to litmus paper, then add 2 cc. of cupric sulfate T.S.: a dark blue precipitate is slowly formed.

B: To 20 mg. of Nicotinamide in a test tube add 5 cc. of sodium hydroxide T.S., and boil the mixture gently: the odor of ammonia is perceptible.

C: Char about 10 mg. of Nicotinamide on a piece of platinum foil: the characteristic odor of pyridine is evolved.

Loss on drying—When dried over sulfuric acid for 4 hours, Nicotinamide loses not more than 0.5 per cent of its weight.

Residue on ignition—Nicotinamide yields not more than 0.1 per cent of residue on ignition, page 685.

Heavy metals—Dissolve 1 Gm. of Nicotinamide in 10 cc. of water, add 7.5 cc. of normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Nicotinamide is 30 parts per million.

Readily carbonizable substances—Dissolve 200 mg. of Nicotinamide in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Assay—Place about 300 mg. of Nicotinamide, previously dried over sulfuric acid for 4 hours and accurately weighed, in a 500-cc. Kjeldahl flask, dissolve it in 200 cc. of water, and add 50 cc. of a 30 per cent solution of sodium hydroxide. Connect the flask by means of a distillation trap to a well-cooled condenser which dips into a vessel containing 40 cc. of tenth-normal sulfuric acid, accurately measured. Boil gently for 20 minutes, avoiding as far as possible distilling any of the liquid. Then increase the temperature and distil about 200 cc. Cool the flask, add 75 cc. of water and continue the distillation, collecting an additional 70 cc. of distillate in the same receiver. Add a few drops of methyl red T.S. to the liquid in the receiving vessel, and titrate the excess of acid with tenth-normal sodium hydroxide. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 12.21 mg. of $C_6H_6N_2O$.

Packaging and storage—Preserve Nicotinamide in tight containers.

AVERAGE DOSE—**25 mg.** (approximately 3/8 grain).

Nicotinamide Injection

NICOTINAMIDE INJECTION

Injectio Nicotinamidi

Inj. Nicotinamid.

Nicotinamide Injection is a sterile solution of nicotinamide in water for injection. It contains not less than 95 per cent and not more than 115 per cent of the labeled amount of $C_6H_6N_2O$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Nicotinamide Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Dilute a quantity of the Injection, equivalent to about 200 mg. of nicotinamide, with water to about 10 cc. Add 1 cc. of solution of sodium hydroxide (1 in 10), evaporate to dryness on a steam bath, add 5 cc. of water, and re-evaporate to about 1 cc. Neutralize with diluted hydrochloric acid, using litmus paper, then add 1 cc. of the acid in excess, and place the solution in a refrigerator for 2 hours. Filter, wash the precipitated nicotinic acid with small portions of ice-cold water until free from chloride, and dry at 100°. The nicotinic acid so obtained melts between 234° and 237° and responds to *Identification tests A* and *B* under *Nicotinic Acid*, page 346.

Colorimetric Control—Transfer an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 50 mg. of nicotinamide, in a 250-cc. volumetric flask, dilute with sufficient water to make exactly 250 cc., and mix well. Prepare a potassium hypobromite solution by dissolving 300 mg. of potassium hydroxide in about 50 cc. of water and adding 2.8 cc. of cold-saturated bromine water, then dilute with water to 100 cc., and mix well. Place 1 cc. of the potassium hypobromite solution in a clean test tube and heat to 70°, then add exactly 1.0 cc. of the dilution of the Injection, and heat in a water bath at 70° (±2°) for 30 minutes. Cool to 50°, add 0.2 cc. of alcohol, allow to stand for 5 minutes, then add 1 cc. of a mixture of 1.0 cc. of normal sulfuric acid and 3 cc. of water. Chill in ice, add 1.0 cc. of a cold solution of sodium nitrite (1 in 1000), rinse the walls of the test tube with a little water and allow to stand in an ice bath for 3 minutes. Add 1 cc. of a solution of ammonium sulfamate (1 in 200), mix thoroughly, and again place in the ice bath for 2 minutes. Remove from the ice bath, add 1 cc. of a solution of N-(1-naphthyl) ethylene diamine dihydrochloride (3 in 1000), and allow to stand for 2 minutes. Dilute with water to exactly 100 cc., mix well, and determine the per cent of light transmission of the solution at 500 millimicrons in a suitable photoelectric colorimeter, taking the light transmission of a blank as 100 per cent. From the per cent of light transmission, calculate the weight of the nicotinamide in the quantity of Injection taken, by means of the curve described in the next paragraph.

Prepare the light transmission curve as follows: weigh accurately 100 mg. of U. S. P. Nicotinamide Reference Standard, previously dried over sulfuric acid for 2 hours, dissolve it in sufficient water to make 100 cc., and mix well. Dilute 15-cc., 20-cc., 25-cc., and 30-cc. portions each with water to 100 cc., and mix well. Place in each of five clean test tubes 1 cc. of the potassium hypobromite solution, heat to 70°, and when this temperature has been reached, add exactly 1.0 cc. of the dilutions to test tubes 1, 2, 3, and 4, respectively, and 1 cc. of water to test tube 5, which is used for a blank. Then proceed as described in the preceding paragraph, beginning with "heat in a water bath at 70°." From the light transmission data

thus obtained, prepare a curve by plotting the per cent transmission of the several dilutions on the ordinate scale against the corresponding quantities of nicotinamide on the abscissa scale. The result corresponds to not less than 95 per cent and not more than 115 per cent of the labeled amount of $C_6H_6N_2O$.

Assay—Dilute an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 100 mg. of nicotinamide, with water to make 1000 cc. and proceed as directed under the *Assay* for *Nicotinamide Tablets*, page 345, beginning with "To an aliquot of suitable size."

Packaging and storage—Preserve Nicotinamide Injection preferably in single-dose containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Nicotinamide Injection usually available contains the following amounts of nicotinamide: 100 mg. (1½ grains) in 1 cc.; 100 mg. (1½ grains) in 2 cc.

AVERAGE DOSE OF NICOTINAMIDE—Parenteral, **100 mg.** (approximately 1½ grains).

Nicotinamide Tablets

NICOTINAMIDE TABLETS

Tabellæ Nicotinamidi

Tab. Nicotinamid.—Niacinamide Tablets

Nicotinamide Tablets contain not less than 95 per cent and not more than 115 per cent of the labeled amount of $C_6H_6N_2O$.

Identification—

A: Extract a quantity of powdered Nicotinamide Tablets, equivalent to about 500 mg. of nicotinamide, with two 10-cc. portions of alcohol, evaporate the filtered alcohol extracts on a steam bath, and dry at about 80°. The residue of nicotinamide so obtained melts between 128° and 131° and responds to *Identification tests B* and *C* under *Nicotinamide*, page 343.

B: Dissolve 100 mg. of the residue obtained in the preceding test in 5 cc. of water, add 5 cc. of sodium hydroxide T.S., and boil gently until the odor of ammonia is no longer perceptible. Cool, neutralize with normal sulfuric acid, using phenolphthalein T.S. as the indicator, and add a few cc. of cupric sulfate T.S.: a blue precipitate gradually forms. Filter the precipitate, and ignite a portion of it on platinum: the odor of pyridine is evolved.

Colorimetric control—Weigh a counted number of not less than 20 Nicotinamide Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a quantity of the powder, equivalent to about 100 mg. of nicotinamide, and gently reflux it with 20 cc. of alcohol for 10 minutes. Filter, and re-extract the residue three times with 15-cc. portions of hot alcohol, filtering the alcohol after each extraction. Finally collect the insoluble residue on a filter, and wash the flask and the filter with several 5-cc. portions of hot alcohol. Evaporate the combined alcohol extract to dryness on a steam bath, and completely transfer the residue, with the aid of water, to a 500-cc. volumetric flask. Dilute with water to the 500-cc. mark, and mix well. Then proceed as directed for *Colorimetric control* under *Nicotinamide Injection*, page 344, beginning with "Prepare a potassium hypobromite solution."

Assay—Place a counted number of not less than 10 Nicotinamide Tablets in a 300-cc. flask containing 100 cc. of normal sulfuric acid. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, cool, add sodium hydroxide T.S. to produce a pH of 6.8, transfer completely to a 1000-cc. volumetric flask, and add sufficient water to make 1000 cc. To an aliquot of suitable size, add water to

make a volume such that 100 cc. contains approximately 10 micrograms of nicotinamide. Using this as the *Test Solution of the Material to be Assayed,* proceed as directed under the *Nicotinic Acid or Nicotinamide Assay,* page 669, beginning with the paragraph headed *Standard Nicotinic Acid Solution.*

Packaging and storage—Preserve Nicotinamide Tablets in tight containers.

Sizes—Nicotinamide Tablets usually available contain the following amounts of nicotinamide: 25 and 50 mg. ($\frac{3}{8}$ and $\frac{3}{4}$ grain).

AVERAGE DOSE OF NICOTINAMIDE—**25 mg.** (approximately $\frac{3}{8}$ grain).

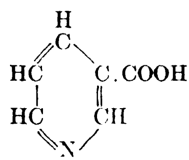
Nicotinic Acid

NICOTINIC ACID

Acidum Nicotinicum

Acid. Nicotin.—Niacin

$C_6H_5O_2N$



Mol. wt. 123 11

Nicotinic Acid, when dried over sulfuric acid for 3 hours, contains not less than 99.5 per cent of $C_6H_5O_2N$.

Description—Nicotinic Acid occurs as white crystals or as a crystalline powder. It is odorless or it may have a slight odor.

Solubility—One Gm. of Nicotinic Acid dissolves in 60 cc. of water. It is freely soluble in boiling water and in boiling alcohol, and also in solutions of alkali hydroxides and carbonates, but is almost insoluble in ether.

Melting range—Nicotinic Acid melts between 234° and 237°, page 667.

Identification—

A: Triturate Nicotinic Acid with twice its weight of 2,4-dinitrochlorobenzene. Gently heat about 10 mg. of the mixture in a test tube until melted, and continue the heating for a few seconds longer. Cool, and add 3 cc. of alcoholic potassium hydroxide T.S.: a deep red to deep wine red color is produced.

B: Dissolve about 50 mg. of Nicotinic Acid in 20 cc. of water, neutralize to litmus paper with tenth-normal sodium hydroxide, and then add 3 cc. of cupric sulfate T.S.: a blue precipitate gradually forms.

Loss on drying—When dried over sulfuric acid for 3 hours, Nicotinic Acid loses not more than 1 per cent of its weight.

Residue on ignition—Nicotinic Acid yields not more than 0.05 per cent of residue on ignition, page 685.

Chloride—A 500-mg. portion of Nicotinic Acid contains no more *Chloride* than corresponds to 0.15 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 500-mg. portion of Nicotinic Acid contains no more *Sulfate* than corresponds to 0.1 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Mix 1 Gm. of Nicotinic Acid with 1.5 cc. of diluted hydrochloric acid, dilute to 25 cc. with water, heat gently until solution is complete, and cool

to room temperature: the heavy metals limit, page 657, for Nicotinic Acid is 20 parts per million.

Assay—Dry about 300 mg. of Nicotinic Acid over sulfuric acid for 3 hours, weigh accurately, dissolve it in about 50 cc. of water, add a few drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide. Each cc. of tenth-normal sodium hydroxide is equivalent to 12.31 mg. of $C_6H_5O_2N$.

Packaging and storage—Preserve Nicotinic Acid in well-closed containers.

AVERAGE DOSE—**25 mg.** (approximately ⅜ grain).

NICOTINIC ACID TABLETS

Tabellæ Acidi Nicotinici

Tab. Acid. Nicotin.—Niacin Tablets

Nicotinic Acid Tablets contain not less than 95 per cent and not more than 115 per cent of the labeled amount of $C_6H_5O_2N$.

Identification—Boil a quantity of powdered Nicotinic Acid Tablets, equivalent to about 500 mg. of nicotinic acid with 25 cc. of alcohol for a few minutes, filter, and wash the residue with a few cc. of hot alcohol. Add to the filtrate 30 cc. of water, and evaporate to about 25 cc. on a steam bath. Cool, filter if insoluble matter separates, and evaporate the filtrate to about 10 cc. Cool, and place in a refrigerator for 1 hour. Filter the separated nicotinic acid with suction, wash it with a few cc. of cold alcohol, and dry at 100°. The nicotinic acid so obtained melts between 234° and 237°, page 667. It also responds to *Identification tests A* and *B* under *Nicotinic Acid,* page 346.

Chemical control—Weigh a counted number of not less than 20 Nicotinic Acid Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 300 mg. of nicotinic acid, and gently reflux it with 40 cc. of reagent alcohol for 10 minutes. Decant the hot alcohol through a small filter, and re-extract the residue three times in a similar manner, using 15 cc. of reagent alcohol each time. Dilute the combined alcohol filtrates with 50 cc. of water, and evaporate to about 50 cc. Cool, add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide. Each cc. of tenth-normal sodium hydroxide is equivalent to 12.31 mg. of $C_6H_5O_2N$. The result corresponds to not less than 95 per cent and not more than 115 per cent of the labeled amount of $C_6H_5O_2N$.

Assay—Add a counted number of not less than 10 Nicotinic Acid Tablets to a 300-cc. flask containing 100 cc. of normal sulfuric acid. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, cool, add sodium hydroxide T.S. to produce a pH of 6.8, and add sufficient water to make 1000 cc. To an aliquot of suitable size, add water to make a volume such that 100 cc. contains approximately 10 micrograms of nicotinic acid. Using this as the *Test Solution of the Material to be Assayed,* proceed as directed under *Nicotinic Acid* or *Nicotinamide Assay,* page 669, beginning with the paragraph headed *Standard Nicotinic Acid Solution.*

Packaging and storage—Preserve Nicotinic Acid Tablets in well-closed containers.

Sizes—Nicotinic Acid Tablets usually available contain the following amounts of nicotinic acid: 25, 50 and 100 mg. (⅜, ¾ and 1½ grains).

AVERAGE DOSE OF NICOTINIC ACID—**25 mg.** (approximately ⅜ grain.

Nitrous Oxide

NITROUS OXIDE

Oxidum Nitrosum

Oxid. Nitros.—Nitrogen Monoxide

N_2O Mol. wt. 44.02

Nitrous Oxide contains not less than 95 per cent by volume of N_2O.

Description—Nitrous Oxide is a colorless gas, without appreciable odor or taste. A liter of Nitrous Oxide at a pressure of 760 mm. and at 0° weighs 1.977 Gm.

Solubility—One volume of Nitrous Oxide dissolves in about 1.5 volumes of water under normal pressure and at 20°. It is more freely soluble in alcohol than in water. It is soluble in ether and in oils.

Note—Cylinders containing Nitrous Oxide must be kept at a temperature of 25°, ±2°, for at least 6 hours before the Nitrous Oxide is withdrawn for the following determinations. Gas volumes for the following tests and assays are to be corrected to a pressure of 760 mm. and a temperature of 25°.

Acids or alkalies—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of 3 color-comparator tubes of clear glass, of approximately the same size and marked "A," "B," and "C," respectively. Add 0.2 cc. of hundredth-normal hydrochloric acid to tube "B" and 0.4 cc. of hundredth-normal hydrochloric acid to tube "C." Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Nitrous Oxide through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that of the solution in tube "C" and no deeper yellow than that of the solution in tube "A."

Carbon dioxide—Pass 1000 cc. of Nitrous Oxide through 50 cc. of clear barium hydroxide T.S., contained in a vessel of such size and shape that the depth of the solution is from 12 to 14 cm., employing a delivery tube with an orifice approximately 1 mm. in diameter and extending to within 2 mm. of the bottom of the vessel, and regulating the flow of the Nitrous Oxide so as to require approximately 15 minutes for the delivery of 1000 cc. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution of 100 mg. of sodium bicarbonate in 100 cc. of freshly boiled and cooled water is added to 50 cc. of clear barium hydroxide T.S.

Oxidizing substances—Pass 2000 cc. of Nitrous Oxide, under conditions comparable to those in the test for *Carbon dioxide*, through 15 cc. of freshly prepared starch-potassium iodide T.S. to which has been added 1 drop of glacial acetic acid. The color of the test solution is not altered by the passage of the Nitrous Oxide, as shown by comparing it with another portion of the acidified starch-potassium iodide T.S. through which the gas has not been passed.

Reducing substances—Pass 2000 cc. of Nitrous Oxide, under conditions comparable to those in the test for *Carbon dioxide*, through a solution of 0.2 cc. of tenth-normal potassium permanganate in 100 cc. of water. Neither the color nor the intensity of the color of the liquid is changed, when compared with the untreated solution.

Halogens—Pass 2000 cc. of Nitrous Oxide, under conditions comparable to those in the test for *Carbon dioxide*, through a mixture of 100 cc. of water and 1 cc. of silver nitrate T.S. The liquid shows no greater degree of opalescence than does a mixture of 100 cc. of water and 1 cc. of silver nitrate T.S., prepared at the same time as that through which the gas passes, the observation being made in 100-cc., low-form Nessler tubes which are closely similar in all respects.

Assay—Close both stopcocks, and immerse the condensation bulb of the assay apparatus, as described on page 674, in liquid nitrogen or in liquid oxygen (so-called liquid air) to the level where the stem joins the bulb, maintaining the liquid nitrogen or the liquid oxygen to within a few mm. of this height. The manometer should

almost immediately show a constant reading, indicating the establishment of equilibrium. Select an arbitrary pressure as a standard (50 mm. is satisfactory) and adjust the system to within ±0.5 mm. of the selected pressure by the addition or removal of air through the burette by means of the leveling bulb, using a hand lens in reading the mercury levels. The pressure reading should remain constant for several minutes to insure a gas-tight system.

Open the burette stopcock so as to communicate with the atmosphere at "A," adjust the leveling bulb so that the burette and the capillary outlet "A" are completely filled with mercury, close the stopcock, and raise the leveling bulb slightly above the outlet tube. With the cylinder in an upright position attach rubber tubing to the valve of the cylinder of Nitrous Oxide to be tested. Flush gas through the tubing, and with the gas flowing, attach the tubing to the gas burette at "A," and immediately open the stopcock. Collect slightly more than 100 cc. of the gas in the burette, against the pressure of the mercury, close the stopcock, disconnect the cylinder of gas, and by means of the leveling bulb adjust the volume of gas in the burette to 100 cc. (±0.1 cc.).

Cautiously open the burette stopcock so as to connect it with the condensation bulb "C," and allow the mercury to rise in the burette until it reaches the plug of the stopcock. Read the manometer pressure after allowing 15 or 20 seconds for the complete condensation of the gas in bulb "C." Determine the difference in mm. of mercury between the present pressure and the selected standard pressure, also record the barometric pressure and the room temperature, and determine the per cent of uncondensable gas by the following formula:

$$\text{Per cent of uncondensable gas in the Nitrous Oxide tested} = \frac{100\,PVT_1}{P_1V_1T}$$

P = increase in pressure in mm. of mercury as determined from the manometer readings.
V = volume in cc. of the condensation bulb.
T_1 = room temperature (absolute).
P_1 = barometric pressure in mm. of mercury.
V_1 = volume in cc. of the Nitrous Oxide tested.
T = temperature (absolute) of the liquid nitrogen bath.

The volume of uncondensable gas does not exceed 5 cc.

The foregoing determination may be checked by measuring the increase in volume in the system due to the uncondensable portion of the gas taken for the assay, proceeding as follows: When the final pressure on the manometer has been recorded, open the burette stopcock so as to communicate with the condensation bulb, after the leveling bulb has been placed in a considerably lowered position so as to avoid the drawing of mercury into the bulb. Adjust the leveling bulb so that the manometer reading corresponds to that of the selected standard pressure, close the burette stopcock, and, by means of the leveling bulb, adjust the pressure on the gas in the burette to equal the atmospheric pressure. The number of cc. of gas represents the percentage of uncondensable gas in the Nitrous Oxide being tested.

After each series of 10 determinations, open the stopcock "D" to the atmosphere, remove the liquid nitrogen bath from the condensation bulb, and maintain this condition until the temperature of the bulb returns to normal or until no liquid Nitrous Oxide can be seen in the bulb.

Packaging and storage—Preserve Nitrous Oxide in tight containers.

Oils, continued

Ointments

Ointments, continued

Ointment, Hydrophilic

HYDROPHILIC OINTMENT

Unguentum Hydrophilicum

Ung. Hydrophil.

Methylparaben	0.25	Gm.
Propylparaben	0.15	Gm.
Sodium Lauryl Sulfate	10	Gm.
Glycerin	120	Gm.
Stearyl Alcohol	250	Gm.
White Petrolatum	250	Gm.
Water	370	Gm.
To make about	1000	Gm.

Melt the stearyl alcohol and the white petrolatum on a water bath, adjust the melted mixture to about 75°, and add the other ingredients, previously dissolved in the water and warmed to 75°. Stir the mixture until it congeals.

Packaging and storage—Preserve Hydrophilic Ointment in tight containers.

Ointment, White

WHITE OINTMENT

Unguentum Album

Ung. Alb.—Simple Ointment

Wool Fat	50 Gm.
White Wax	50 Gm.
White Petrolatum	900 Gm.
To make	1000 Gm.

Melt the white wax in a suitable dish on a water bath, add the other ingredients, warm until they are liquefied, then discontinue the heating, and stir the mixture until it begins to congeal (see page 2).

Ointment, Yellow

YELLOW OINTMENT

Unguentum Flavum

Ung. Flav.

Wool Fat	50 Gm.
Yellow Wax	50 Gm.
Petrolatum	900 Gm.
To make	1000 Gm.

Melt the yellow wax in a suitable dish on a water bath, add the other ingredients, warm until they are liquefied, then discontinue the heating, and stir the mixture until it begins to congeal (see page 2).

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Oleic Acid

OLEIC ACID

Acidum Oleicum

Acid. Oleic.

$C_{18}H_{34}O_2$ Mol. wt. 282.45

Oleic Acid is a liquid acid obtained from tallow and other fats, and consists chiefly of $CH_3(CH_2)_7CH{:}CH(CH_2)_7COOH$.

Description—Oleic Acid is a pale yellow to brownish yellow, oily liquid. It has a peculiar, lard-like odor and taste. On exposure to air it gradually absorbs oxygen and darkens. When strongly heated in air, Oleic Acid is decomposed with the production of acrid vapors. Its specific gravity is about 0.895.

Solubility—Oleic Acid is almost insoluble in water, but is miscible with alcohol, chloroform, ether, and benzene, and with fixed and volatile oils.

Congealing temperature—Oleic Acid congeals at a temperature not above 10°, page 629.

Residue on ignition—A 5-cc. portion of Oleic Acid yields not more than 5 mg. of residue on ignition, page 685.

Mineral acids—Shake 5 cc. of Oleic Acid with an equal volume of water at a temperature of about 25° for 2 minutes, allow the liquids to separate, and filter through a paper filter previously moistened with water: the water liquid is not reddened by the addition of 1 drop of methyl orange T.S.

Neutral fat or mineral oil—Boil 1 cc. of Oleic Acid with about 500 mg. of sodium carbonate and 30 cc. of water in a capacious flask: the resulting solution, while hot, is clear or, at most, opalescent.

Acid value—The acid value of Oleic Acid is not less than 188 and not more than 203, using about 1 Gm. of Acid, accurately weighed, page 646.

Iodine value—The iodine value of Oleic Acid is not less than 85 and not more than 95, page 647.

Packaging and storage—Preserve Oleic Acid in tight containers.

Oleoresin

Oleovitamin A

OLEOVITAMIN A

Oleovitamina A

Oleovitam. A—Natural Vitamin A in Oil

Oleovitamin A is either fish liver oil, or fish liver oil diluted with an edible vegetable oil, or a solution of Vitamin A concentrate, from natural (animal) sources, in fish liver oil or in an edible vegetable oil. Oleovitamin A contains, in each Gm., not less than 50,000 and not more than 65,000 U. S. P. Units of Vitamin A, and not more than 1000 U. S. P. Units of Vitamin D.

Description—Oleovitamin A is a thin, oily liquid which may have a fishy, but not a rancid, odor and taste.

Free fatty acids—Dissolve 2 Gm. of Oleovitamin A, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator, and boil the solution gently under a reflux condenser for 10 minutes. Cool, and titrate the mixture with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking the mixture for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Assays—Proceed as directed under *Vitamins A and D Assays*, page 718.

Packaging and storage—Preserve Oleovitamin A in tight containers. It may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Oleovitamin A Capsules

OLEOVITAMIN A CAPSULES

Capsulæ Oleovitaminæ A

Cap. Oleovitam. A

Oleovitamin A Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of oleovitamin A. The oil in Oleovitamin A Capsules conforms to the definition for *Oleovitamin A*, page 353, but may be adjusted in Vitamin A potency. Oleovitamin A Capsules shall be labeled to contain either 5000 or 25,000 U. S. P. Units of Vitamin A per Capsule.

Oil content of capsules—Weigh accurately 20 Oleovitamin A Capsules in a tared weighing bottle. Carefully open the capsules without any loss of the shell material, and transfer the contents to a suitable container. Remove any oil remaining in the emptied capsules by washing with small portions of ether, and allow the capsules to dry at room temperature until the odor of ether is no longer perceptible. Weigh the emptied capsules in the same tared bottle in which the full capsules were weighed. The difference represents the weight of oil in the 20 Capsules.

When the oil in the Capsules is dispersed throughout a solid or semi-solid gelatin medium, proceed as directed under *Halibut Liver Oil Capsules*, page 248.

Description, test, and assay—The oil contained in Oleovitamin A Capsules conforms in all respects, with the exception of the potency requirements, to the specifications under *Oleovitamin A*, page 353. The Vitamin A potency shall be that claimed on the label.

Packaging and storage—Preserve Oleovitamin A Capsules in well-closed containers and protect the oil in the Capsules from light.

Average daily prophylactic dose—One Capsule containing 5000 U. S. P. Vitamin A Units.

Note—The dose of the 25,000 Vitamin A-Unit Capsules is to be determined by the physician in accordance with the needs of the patient.

Oleovitamin A and D

OLEOVITAMIN A AND D

Oleovitamina A et D

Oleovitam. A et D

Oleovitamin A and D is either fish liver oil, or fish liver oil diluted with an edible vegetable oil, or a solution of Vitamin A and D concentrates in fish liver oil or in an edible vegetable oil. The Vitamin A shall be obtained from natural (animal) sources and the Vitamin D may be obtained from natural (animal) sources or may be synthetic oleovitamin D. Oleovitamin A and D contains, in each Gm., not less than 850 and not

more than 1100 U. S. P. Units of Vitamin A, and not less than 85 and not more than 110 U. S. P. Units of Vitamin D.

Oleovitamin A and D may be flavored by the addition of not more than 1 per cent of any one or any mixture of flavoring substances recognized in this Pharmacopœia.

Description—Oleovitamin A and D is a thin, oily liquid, which may have a fishy, but not rancid, odor and taste.

Solubility—Oleovitamin A and D is slightly soluble in alcohol, but is miscible in all proportions with ether and with chloroform.

Color—When viewed transversely in a tall, cylindrical, standard, oil-sample bottle of colorless glass of about 120-cc. capacity, the color of Oleovitamin A and D shall not be more intense than that of a mixture of 11 cc. of cobaltous chloride C.S., 76 cc. of ferric chloride C.S., and 33 cc. of water, in a similar bottle of the same internal diameter.

Free fatty acids—Dissolve 2 Gm. of Oleovitamin A and D, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator, and boil the solution gently under a reflux condenser for 10 minutes. Cool, and titrate the mixture with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Assays—Proceed as directed under *Vitamins A and D Assays*, page 718.

Packaging and storage—Preserve Oleovitamin A and D in tight containers and avoid exposure to excessive heat. It may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

AVERAGE DAILY DOSE—Infants and adults, 8 cc. (approximately 2 fluidrachms).

Oleovitamin A and D, Concentrated

CONCENTRATED OLEOVITAMIN A AND D

Oleovitamina A et D Concentrata

Oleovitam. A et D Conc.

Concentrated Oleovitamin A and D is either fish liver oil, or fish liver oil diluted with an edible vegetable oil, or a solution of Vitamin A and D concentrates in fish liver oil or in an edible vegetable oil. The Vitamin A is obtained from natural (animal) sources and the Vitamin D may be from natural (animal) sources or may be synthetic oleovitamin D. Concentrated Oleovitamin A and D contains, in each Gm., not less than 50,000 and not more than 65,000 U. S. P. Units of Vitamin A, and not less than 10,000 and not more than 13,000 U. S. P. Units of Vitamin D.

Description—Concentrated Oleovitamin A and D is a thin, oily liquid which may have a fishy, but not a rancid, odor and taste.

Free fatty acids—Dissolve 2 Gm. of Concentrated Oleovitamin A and D, accurately weighed, in 30 cc. of a mixture of equal volumes of alcohol and ether, the mixture

having been previously neutralized with tenth-normal sodium hydroxide, using 5 drops of phenolphthalein T.S. as the indicator, and boil the solution gently under a reflux condenser for 10 minutes. Cool, and titrate the mixture with tenth-normal sodium hydroxide to the production of a pink color which persists after shaking the mixture for 30 seconds: not more than 1 cc. of tenth-normal sodium hydroxide is required.

Assays—Proceed as directed under *Vitamins A and D Assays*, page 718.

Packaging and storage—Preserve Concentrated Oleovitamin A and D in tight containers. It may be bottled or packaged in containers from which the air has been expelled by the production of a vacuum or by an inert gas.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Oleovitamin A and D, Concentrated, Capsules

CONCENTRATED OLEOVITAMIN A AND D CAPSULES

Capsulæ Oleovitaminæ A et D Concentratæ

Cap. Oleovitam. A et D Conc.—Concentrated Vitamin A and D Capsules

Concentrated Oleovitamin A and D Capsules contain not less than 95 per cent and not more than 105 per cent of the labeled amount of concentrated oleovitamin A and D.

The oil in Concentrated Oleovitamin A and D Capsules conforms to the definition for *Concentrated Oleovitamin A and D*, page 355, but may be adjusted in Vitamin A and Vitamin D potency. Concentrated Oleovitamin A and D Capsules shall be labeled to contain 5000 U. S. P. Units of Vitamin A and 1000 U. S. P. Units of Vitamin D per Capsule.

Oil content of capsules—Weigh accurately 20 Oleovitamin A and D Capsules in a tared weighing bottle. Carefully open the capsules without any loss of the shell material, and transfer the contents to a suitable container. Remove any oil remaining in the emptied capsules by washing with small portions of ether, and allow the capsules to dry at room temperature until the odor of ether is no longer perceptible. Weigh the emptied capsules in the same tared bottle in which the full capsules were weighed. The difference represents the weight of oil in the 20 Capsules.

When the oil in the Capsules is dispersed throughout a solid or semi-solid gelatin medium, proceed as directed under *Halibut Liver Oil Capsules*, page 248.

Description, test, and assay—The oil contained in Concentrated Oleovitamin A and D Capsules conforms in all respects, with the exception of the potency requirements, to the specifications for *Concentrated Oleovitamin A and D*, page 355. The Vitamin A and Vitamin D potency shall be that claimed on the label.

Packaging and storage—Preserve Concentrated Oleovitamin A and D Capsules in well-closed containers and protect the oil in the Capsules from light.

AVERAGE DAILY PROPHYLACTIC DOSE—One Capsule.

Oleovitamin D, Synthetic

SYNTHETIC OLEOVITAMIN D

Oleovitamina D Synthetica

Oleovitam. D Synth. —Viosterol in Oil (Applying only to Activated Ergosterol in Oil)

Synthetic Oleovitamin D is a solution of activated ergosterol, or activated 7-dehydro-cholesterol, in an edible vegetable oil. Synthetic Oleovitamin D contains in each Gm. not less than 10,000 U. S. P. Units of Vitamin D.

Description—Synthetic Oleovitamin D is a clear, colorless to light yellow, oily liquid. It is almost odorless, and has a bland taste.

Solubility—Synthetic Oleovitamin D is slightly soluble in alcohol, but is miscible with ether and with chloroform.

Free fatty acids—The free fatty acids in 2 Gm. of Synthetic Oleovitamin D shall require for neutralization not more than 1.5 cc. of fiftieth-normal sodium hydroxide, page 646.

Assay—Proceed as directed under *Vitamins A and D Assays*, page 718.

Labeling—Synthetic Oleovitamin D must be labeled to indicate whether it contains activated ergosterol (*Vitamin* D_2 or *Viosterol*) or whether it contains activated 7-dehydro-cholesterol (*Vitamin* D_3).

Packaging and storage—Preserve Synthetic Oleovitamin D in small, tight containers.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Olive Oil

OLIVE OIL

Oleum Olivæ

Ol. Oliv.—Sweet Oil

Olive Oil is the fixed oil obtained from the ripe fruit of *Olea europæa* Linné (Fam. *Oleaceæ*).

Description—Olive Oil is a pale yellow, or light greenish yellow, oily liquid, having a slight, characteristic odor and taste, with a faintly acrid after-taste.

Solubility—Olive Oil is slightly soluble in alcohol. It is miscible with ether, with chloroform, and with carbon disulfide.

Specific gravity—The specific gravity of Olive Oil is not less than 0.910 and not more than 0.915.

Cottonseed oil—Mix 5 cc. of Olive Oil in a test tube with 5 cc. of a mixture of equal volumes of amyl alcohol and a 1 per cent solution of sulfur in carbon disulfide, warm the mixture carefully until the carbon disulfide is expelled, and immerse the test tube to one-third of its length in a boiling, saturated solution of sodium chloride: the mixture develops no reddish color within 2 hours.

Peanut oil—Saponify 10 Gm. of Olive Oil by heating it for 1 hour under a reflux condenser with a solution of 4 Gm. of potassium hydroxide in 80 cc. of alcohol. Neutralize exactly with diluted acetic acid, using phenolphthalein T.S. as the indicator, and wash into 120 cc. of boiling lead acetate T.S. Boil the mixture for 1 minute,

and cool by immersing the flask in cold water, occasionally rotating the contents to cause the precipitate to adhere to the sides of the flask. Decant the liquid, wash the precipitate with cold water to remove the excess of lead acetate, and then wash with 90 per cent alcohol (by volume). Add 100 cc. of ether, stopper the flask well, and allow it to stand until the precipitate is disintegrated. Connect with a reflux condenser, boil for 5 minutes, cool to about 15°, and allow it to stand over night. Filter, and thoroughly wash the precipitate of lead soaps with ether. Wash the precipitate into a 500-cc. separator by means of a jet of ether, alternating with diluted hydrochloric acid at the end if a little of the precipitate adheres to the filter paper. Add enough diluted hydrochloric acid to make the total acid layer measure about 100 cc., and enough ether to make the total ether layer measure about 100 cc., and shake the mixture vigorously for several minutes. Allow the layers to separate, draw off the acid layer, and wash the ether once by shaking with 50 cc. of diluted hydrochloric acid and then with several portions of water until the last washing is not acid to methyl orange T.S. Transfer the ether solution to a dry flask, evaporate the ether, add a little dehydrated alcohol, and evaporate on a water bath. Dissolve the residue of the dry fatty acids by warming with 60 cc. of 90 per cent alcohol, by volume, slowly cool the solution to 15°, shaking frequently, and allow the mixture to stand at 15° for 30 minutes: no crystals separate from the mixture.

Sesame oil—Mix 10 cc. of Olive Oil with 10 cc. of hydrochloric acid, add 0.1 cc. of an alcohol solution of furfural (1 in 50), and shake the mixture vigorously for 15 seconds: no pink to crimson color appears in the acid layer when the emulsion breaks. Should any color appear in the acid layer, add 10 cc. of water, and again shake the mixture vigorously. In the absence of sesame oil the pink color is fugitive.

Teaseed oil—In a dry test tube of approximately 18 × 150 mm. place 0.8 cc. of acetic anhydride, 1.5 cc. of chloroform, and 0.2 cc. of sulfuric acid. Mix, and cool in a water bath to 25°. Add 7 drops of Olive Oil (approximately 200 mg.), mix well, and cool again to 25°. If the solution is cloudy, add acetic anhydride, drop by drop, shaking after each addition, until the solution suddenly clears. Allow the mixture to remain in the water bath for 5 minutes: it shows a green color by both reflected and transmitted light. Add 10 cc. of absolute ether, and mix by inverting the tube. The initial green color fades to a brownish gray. Before being diluted with the ether, *teaseed oil* will cause a brown color to appear by transmitted light and after being diluted, a transient red color.

Free fatty acids—The free fatty acids in 10 Gm. of Olive Oil require for neutralization not more than 5 cc. of tenth-normal sodium hydroxide, page 646.

Iodine value—The iodine value of Olive Oil is not less than 79 and not more than 88, page 647.

Saponification value—The saponification value of Olive Oil is not less than 190 and not more than 195, page 647.

Solidification range of the fatty acids—The solidification temperature of the mixed fatty acids of Olive Oil is not below 17° and not above 26°, page 645.

Packaging and storage—Preserve Olive Oil in tight containers.

AVERAGE DOSE—**30 cc.** (approximately 1 fluidounce).

Opium

OPIUM

Opium

Gum Opium

Opium is the air-dried milky exudation obtained by incising the unripe capsules of *Papaver somniferum* Linné or its variety *album* De Candolle

(Fam. *Papaveraceæ*). It yields not less than 9.5 per cent of anhydrous morphine.

Description—In more or less rounded, somewhat flattened masses, usually about 8 to 15 cm. in diameter; externally dark brown, covered with fragments of poppy leaves and at times with fruits of a species of *Rumex* adhering from the packing; more or less plastic when fresh, becoming hard and brittle or tough on keeping; internally, coarsely granular or nearly smooth, dark brown, frequently interspersed with lighter areas, somewhat lustrous; odor characteristic, narcotic; taste very bitter, characteristic.

Assay—Weigh accurately 6 Gm. of Opium which, if fresh, should be in very small pieces and, if dry, in a fine powder. Place the Opium in a mortar and triturate it with about 40 cc. of warm water for 15 minutes. Transfer the contents of the mortar completely with the aid of 30 cc. of water into a flask, stopper the flask, and shake it every 10 minutes, or continuously in a mechanical shaker during 1 hour. The extraction of the Opium may also be made in the following manner: Place the comminuted opium as described above in a flask with 70 cc. of water, add a few glass beads, if desired, and shake every 10 minutes, or continuously in a mechanical shaker during 2 hours, and allow to stand over night, then on the following morning shake the flask for 30 minutes.

Pour the contents of the flask as evenly as possible upon a wetted filter of 10 to 11 cm. diameter, and, when the liquid has drained off well, wash the residue with about 20 cc. of water, carefully dropped upon the edges of the filter and its contents. Transfer the residue on the filter as completely as possible into the flask with the aid of about 40 cc. of water, shake it thoroughly during 10 minutes, and filter through the original filter. Filtration and washing of the residue may be facilitated by the use of a centrifuge. When the liquid has drained off, wash the flask and residue with small portions of water until the washings are nearly colorless. (The total filtrate will usually measure 300 to 350 cc.) Evaporate the filtrate and washings in a tared dish to about 30 Gm., and allow to cool. Now add 3 Gm. of calcium hydroxide, triturate for 15 minutes, then transfer the mixture completely to a tared flask with the aid of small portions of water. Add sufficient water to make 54 Gm. and mix well. Filter through a dry filter of 10 to 11 cm. diameter, collecting the filtrate in a dry cylinder or a small flask. During the filtration keep the funnel covered with a glass plate and its stem well within the neck of the receiving vessel.

Place 34 Gm. of the filtrate, corresponding to 4 Gm. of Opium, in an Erlenmeyer flask of suitable capacity, add 2 cc. of alcohol and 15 cc. of ether, and, after shaking, add 1 Gm. of ammonium chloride. Stopper the flask, shake it frequently during 10 minutes, and set aside over night at a temperature of 5° to 10°. Remove the stopper and brush any adhering crystals back into the flask. Decant the ether layer through a small filter paper or through a sintered glass crucible, rinse the flask and contents with 15 cc. of ether, and pass these washings through the filter. Again wash the filter and precipitate with an additional 10 cc. of ether. When all of the ether has passed through the filter, pour the water layer on the filter without trying to remove the crystals from the flask. Wash the crystals in the flask and the contents of the filter with small portions of water saturated with morphine, using a total of 40 cc. of the morphinated water. Then add, dropwise, 1 cc. of cold water to displace the morphinated water.

Add to the flask containing the crystals about 15 cc. of boiling reagent methanol, agitate to dissolve as much of the morphine as possible, and pour the boiling solution over the morphine on the filter, receiving the filtrate in a suitable dry flask or beaker. Repeat this treatment with boiling reagent methanol eight to ten times, using 5 to 7 cc. each time, until all of the morphine has been dissolved. Cool the methanol solution, and add to it exactly 25 cc. of tenth-normal sulfuric acid. Dilute with 75 cc. of water, and boil carefully, or evaporate on a steam bath, to a volume of about 50 cc. Cool, and titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 28.53 mg. of anhydrous morphine.

Opium, Granulated

GRANULATED OPIUM

Opium Granulatum

Opium Gran.

Opium, dried at a temperature not exceeding 70°, and reduced to granules, all of which will pass through a number 16 standard mesh sieve and not more than 10 per cent through a number 60 standard mesh sieve.

Granulated Opium yields not less than 10 per cent and not more than 10.5 per cent of anhydrous morphine. Granulated Opium of a higher morphine percentage may be reduced to the official standard by admixture with granulated opium of a lower percentage, or with any of the diluents permitted for powdered extracts under *Extracts*, page 643.

Description—When powdered, Granulated Opium corresponds to the description under *Powdered Opium*, page 360, except as to the size of the particles.
Assay—Proceed as directed under *Opium*, page 358.
Packaging and storage—Preserve Granulated Opium in well-closed containers.

AVERAGE DOSE—**60 mg.** (approximately 1 grain).

Opium, Powdered

POWDERED OPIUM

Opium Pulveratum

Opium Pulv.—Opii pulvis P.I.

Opium, dried at a temperature not exceeding 70°, and reduced to a very fine powder.

Powdered Opium yields not less than 10 per cent and not more than 10.5 per cent of anhydrous morphine. Powdered opium of a higher morphine percentage may be reduced to the official standard by admixture with powdered opium of a lower percentage, or with any of the diluents permitted for powdered extracts under *Extracts*, page 643.

Description—Light brown to moderate yellowish brown, consisting chiefly of yellowish brown to yellow, more or less irregular and granular fragments, varying from 15 to 150 microns in diameter; a few fragments of strongly lignified, thick-walled, 4- to 5-sided or narrowly elongated, epidermal cells of the poppy capsule; very few fragments of tissues of poppy leaves, poppy capsules, and occasionally *Rumex* fruits. In addition, there will be the microscopic characteristics of the diluent if any has been used in the preparation of the powder.

Assay—Proceed as directed under *Opium*, page 358.
Packaging and storage—Preserve Powdered Opium in well-closed containers.

AVERAGE DOSE—**60 mg.** (approximately 1 grain).

OPIUM TINCTURE

Tinctura Opii

Tr. Opii—Laudanum, Deodorized Opium Tincture, Tinctura opii P.I.

Opium Tincture yields, from each 100 cc., not less than 0.95 Gm. and not more than 1.05 Gm. of anhydrous morphine.

GRANULATED OPIUM	100 Gm.
To make about	1000 cc.

Heat 500 cc. of water to boiling, pour it on the granulated opium contained in a suitable vessel, and stir the mixture frequently during 24 hours. Transfer the mixture to a percolator, and, when the liquid has ceased to drop, continue the percolation slowly, using water as the menstruum, until the opium is exhausted.

Concentrate the percolate by evaporation until it measures 400 cc. Boil it actively for at least 15 minutes, and then allow it to stand over night. Then heat the mixture to 80°, add 50 Gm. of paraffin, and continue the heating until the paraffin is melted. Then beat the mixture thoroughly and set it aside to cool.

Remove the paraffin and rinse it with a few cc. of water, adding the rinsings to the liquid. Filter, and add a sufficient quantity of water through the filter to make the product measure 750 cc. Add 188 cc. of alcohol to the filtered liquid, and assay a portion of this liquid as directed below. Dilute the remainder of the liquid with such a quantity of a mixture of 1 volume of alcohol and 4 volumes of water as the calculations from the assay indicate is necessary to produce a Tincture containing 1 Gm. of anhydrous morphine in each 100 cc. Mix thoroughly.

Assay—Measure accurately 60 cc. of Opium Tincture, and evaporate it on a water bath until the alcohol is removed, then add about 20 cc. of water, and mix thoroughly. Transfer the mixture as evenly as possible to a wetted filter of from 10 to 11 cm. in diameter, rinse the container with water, and pour the rinsings upon the filter. Then complete the assay as directed under *Opium*, page 358, line 17, beginning with the words "When the liquid has drained off." The calculated quantity of anhydrous morphine, multiplied by 2.5, represents the amount of anhydrous morphine in each 100 cc. of the Tincture.

Packaging and storage—Preserve Opium Tincture in tight, light-resistant containers, and avoid exposure to excessive heat.
Alcohol content—From 17 to 19 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—**0.6 cc.** (approximately 10 minims).

Opium Tincture, Camphorated

CAMPHORATED OPIUM TINCTURE

Tinctura Opii Camphorata

Tr. Opii Camph.—Paregoric, Tinctura opii benzoica P.I.

Camphorated Opium Tincture yields, from each 100 cc., not less than 35 mg. and not more than 45 mg. of anhydrous morphine.

OPIUM TINCTURE	40 cc.
ANISE OIL	4 cc.
BENZOIC ACID	4 Gm.
CAMPHOR	4 Gm.
To make	1000 cc.

Dissolve the ingredients in 900 cc. of diluted alcohol, add 40 cc. of glycerin, and then sufficient diluted alcohol to make the product measure 1000 cc. Agitate the mixture and filter it.

Camphorated Opium Tincture may also be prepared as follows:

POWDERED OPIUM	4.3 Gm.
ANISE OIL	3.8 cc.
BENZOIC ACID	3.8 Gm.
CAMPHOR	3.8 Gm.
To make	1000 cc.

Macerate the ingredients for 5 days, with occasional agitation, in a mixture of 900 cc. of diluted alcohol and 38 cc. of glycerin. Then filter, and pass enough diluted alcohol through the filter to obtain 950 cc. of total filtrate. Assay a portion of this filtrate as directed below, and dilute the remainder with a sufficient quantity of diluted alcohol containing, in each 100 cc., 0.4 cc. of anise oil, 400 mg. of benzoic acid, 400 mg. of camphor, and 4 cc. of glycerin, to produce a Tincture containing, in each 100 cc., 40 mg. of anhydrous morphine.

Assay—Measure accurately 100 cc. of the Tincture, add 2 cc. of approximately normal sulfuric acid, and evaporate to about 10 cc. Transfer the residue completely to a separator with the aid of small quantities of a mixture of equal volumes of

approximately normal sulfuric acid and water, using a total of 15 cc. of the acid-water. Finally, wash the dish with several cc. of a mixture of 85 volumes of chloroform and 15 volumes of alcohol, and add these washings to the separator. Dissolve 2 Gm. of sodium chloride in the liquid in the separator, neutralize to litmus paper with stronger ammonia T.S., and then add several drops of the ammonia in excess. Immediately extract the mixture with 25-cc. portions of a mixture of 85 volumes of chloroform and 15 volumes of alcohol until the residue obtained by evaporating 1 cc. of the last extract gives a negative test for morphine with sulfuric acid which contains in each cc. 1 drop of formaldehyde T.S., and collect the extracts in a second separator. Usually four extractions will suffice, but if more than four are required, increase the quantities and volumes of all subsequent reagents to maintain the proportions here prescribed.

Dissolve 25 Gm. of sodium hydroxide in 1000 cc. of water, saturate the solution with sodium chloride, and filter. Remove the morphine from the combined chloroform-alcohol extracts by shaking with several successive 15-cc. portions of the alkaline salt solution, collecting the latter in a separator. Wash the combined alkaline salt solutions with 10 cc. of chloroform, and discard the chloroform. Neutralize the alkaline salt solution to litmus paper by the addition of hydrochloric acid, and finally add a slight excess of acid. Cool the solution to 25°, and shake it with 10 cc. of chloroform. Remove the chloroform to another separator, and shake it with 5 cc. of saturated sodium chloride solution, to which a few drops of hydrochloric acid have been added. Discard the chloroform, and add the acid salt solution to the combined acidulated solution.

Now add stronger ammonia T.S. to the solution until it is neutral to litmus paper, and then add a slight excess of the ammonia. Cool the solution to 25°, and immediately extract the alkaloids with successive portions of the chloroform-alcohol mixture. Filter each extract into a container through purified cotton, wetted with the chloroform-alcohol mixture, and when completely extracted discard the liquid in the separator.

Evaporate the combined chloroform solutions on a water bath to a volume of about 1 cc., then add 10 cc. of alcohol, neutral to methyl red T.S., and warm the mixture to dissolve the alkaloids and to remove the last traces of chloroform. Add exactly 20 cc. of fiftieth-normal sulfuric acid, and warm, if necessary, to dissolve the alkaloid completely. Guard against the presence of undissolved particles. Cool, add 15 to 20 cc. of recently boiled and cooled water, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 5.707 mg. of anhydrous morphine.

Packaging and storage—Preserve Camphorated Opium Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol Content—From 44 to 46 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—4 cc. (approximately 1 fluidrachm).

Orange Flower Syrup

ORANGE FLOWER SYRUP

Syrupus Aurantii Florum

Syr. Aurant. Flor.

ORANGE FLOWER WATER	225 cc.
SUCROSE	850 Gm.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Mix the orange flower water with 225 cc. of distilled water, dissolve the sucrose in the mixture by agitation without heating, and add sufficient distilled water to make the product measure 1000 cc. Mix thoroughly and strain.

Orange Flower Syrup may also be made in the following manner:

Prepare a percolator in the manner described under *Syrup*, page 548. Pour the mixture of orange flower water and distilled water upon the sucrose, and, when all of the liquid has run through, return portions of the percolate, if necessary, to dissolve all of the sucrose. Then pass enough distilled water through the cotton to make the product measure 1000 cc. Mix thoroughly.

Packaging and storage—Preserve Orange Flower Syrup in tight containers, preferably at a temperature not above 25°.

Orange Flower Water

ORANGE FLOWER WATER

Aqua Aurantii Florum

Aq. Aurant. Flor.

Orange Flower Water is a saturated solution of the odoriferous principles of the flowers of *Citrus Aurantium* Linné (Fam. *Rutaceæ*), prepared by distilling the fresh flowers with water and separating the excess volatile oil from the clear, water portion of the distillate. Its odor is best preserved by allowing a limited access of fresh air to the container.

Description—Orange Flower Water is nearly colorless, clear or only faintly opalescent, possessing the pleasant odor and taste of orange blossoms. It must be free from empyreuma, mustiness, and fungoid growths.

Residue—Evaporate 100 cc. of Orange Flower Water on a water bath, and dry the residue to constant weight at 100°: not more than 15 mg. of residue remains.

Reaction—Orange Flower Water is neutral or only slightly acid to litmus paper.

Heavy metals—Add 2 cc. of diluted acetic acid to 5 cc. of Orange Flower Water and dilute to 25 cc. with water: the heavy metals limit, page 657, for Orange Flower Water is 2 parts per million.

ORANGE OIL

Oleum Aurantii

Ol. Aurant.—Sweet Orange Oil

Orange Oil is the volatile oil obtained by expression from the fresh peel of the ripe fruit of *Citrus sinensis* (Linné) Osbeck (Fam. *Rutaceæ*).

Note—Orange Oil which has a terebinthinate odor must not be used or dispensed.

Description—Orange Oil is an intense yellow, orange, or deep orange liquid, having the characteristic odor and taste of the outer part of fresh sweet orange peel.

Solubility—Orange Oil is miscible with dehydrated alcohol and with carbon disulfide, and dissolves in an equal volume of glacial acetic acid.

Specific gravity—The specific gravity of Orange Oil is not less than 0.842 and not more than 0.846.

Optical rotation—The optical rotation of Orange Oil is not less than +94° and not more than +99° in a 100-mm. tube, page 675.

Refractive index—The refractive index of Orange Oil is not less than 1.4723 and not more than 1.4737, page 682.

Reaction—A solution of recently expressed Orange Oil in dehydrated alcohol (1 in 5) is neutral to moistened litmus paper.

Heavy metals—Orange Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 658.

Washed citrus oils—

A: Evaporate 5 Gm. of Orange Oil to constant weight at 100°: the residue weighs not less than 85 mg.

B: Orange Oil does not form a clear solution with 2 volumes of 90 per cent alcohol.

Foreign oils—Place 50 cc. of Orange Oil in a three-bulb Ladenburg flask of approximately the following dimensions: the lower or main bulb 6 cm. in diameter, with the smaller condensing bulbs 3.5 cm., 3.0 cm., and 2.5 cm., respectively, in diameter; the distance from the bottom of the flask to the side arm 20 cm. Distil the Oil at the rate of 1 drop per second until the distillate measures 5 cc.: the optical rotation of the distillate is equal to that of the original Oil or does not differ from it by more than 2 degrees, and the refractive index of the distillate at 20° is not less than 0.0008 and not more than 0.0015 lower than that of the original Oil at 20°.

Packaging and storage—Preserve Orange Oil in well-filled, tight containers and avoid exposure to excessive heat.

BITTER ORANGE PEEL

Aurantii Amari Cortex

Aurant. Amar. Cort.

Bitter Orange Peel is the dried rind of the unripe fruit of *Citrus Aurantium* Linné (Fam. *Rutaceæ*).

Description—

Unground Bitter Orange Peel—In irregular bands (ribbons) or quarters from 2 to 6 mm. in thickness; outer surface weak brown to moderate olive with numerous

pits and fine reticulate ridges; inner surface weak yellow to weak greenish yellow with many slight conical projections and fine anastomosing lines formed by the vascular bundles; fracture hard, short; odor fragrant and aromatic; taste aromatic and bitter.

Histology—An epidermis of small, angular cells; an outer parenchyma of thick-walled cells containing chloroplasts or chromoplasts and occasionally calcium oxalate prisms, and bearing the large schizo-lysigenous oil reservoirs, arranged mostly in two irregular rows; an inner spongy parenchyma of branched cells surrounding large intercellular spaces, and bearing delicate, anastomosing vascular bundles.

Powdered Bitter Orange Peel—Weak yellow to weak greenish yellow; fragments of parenchyma abundant, the cell walls from 4 to 12 microns thick; tracheæ very small with close spiral markings or simple pores; calcium oxalate prisms from 15 to 45 microns long.

Orange Peel, Bitter, Tincture

BITTER ORANGE PEEL TINCTURE

Tinctura Aurantii Amari

Tr. Aurant. Amar.

Bitter Orange Peel, in moderately coarse powder...	200 Gm.
To make............................	1000 cc.

Prepare a tincture by Process P, page 708, using a mixture of 2 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug from 12 to 16 hours, and percolate at a moderate rate.

Packaging and storage—Preserve Bitter Orange Peel Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol content—From 58 to 62 per cent, by volume, of C_2H_5OH.

Orange Peel, Sweet

SWEET ORANGE PEEL

Aurantii Dulcis Cortex

Aurant. Dulc. Cort.

Sweet Orange Peel is the fresh, outer rind of the non-artificially colored, ripe fruit of *Citrus sinensis* (Linné) Osbeck (Fam. *Rutaceæ*).

Note—The inner, white portion of the rind should be excluded.

Description—

Unground Sweet Orange Peel—The outer, orange yellow layer separated from the fresh fruit by grating or paring and consisting of epidermal cells, parenchyma, and oil reservoirs with globules of volatile oil; odor highly fragrant; taste pungently aromatic.

Orange Peel, Sweet, Tincture

SWEET ORANGE PEEL TINCTURE

Tinctura Aurantii Dulcis

Tr. Aurant. Dulc.

SWEET ORANGE PEEL, the outer yellow rind grated or pared from the fresh fruit	500 Gm.
To make	1000 cc.

Prepare a tincture by Process M, page 708, macerating the drug in 900 cc. of alcohol and completing the preparation with alcohol. Use purified cotton or talc as the filtering medium.

Packaging and storage—Preserve Sweet Orange Peel Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 73 to 76 per cent, by volume, of C_2H_5OH.

Orange Spirit, Compound

COMPOUND ORANGE SPIRIT

Spiritus Aurantii Compositus

Sp. Aurant. Co.

Compound Orange Spirit contains, in each 100 cc., not less than 25 cc. and not more than 30 cc. of the mixed oils.

ORANGE OIL	200 cc.
LEMON OIL	50 cc.
CORIANDER OIL	20 cc.
ANISE OIL	5 cc.
ALCOHOL, a sufficient quantity,	
To make	1000 cc.

Mix the oils with sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 2 cc. of Compound Orange Spirit to a Babcock bottle, graduated to 8 per cent, add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Then add sufficient saturated calcium chloride solution, acidified with hydrochloric acid, almost to fill the bulb of the bottle. Rotate the bottle vigorously to insure thorough mixing, and then add sufficient of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and read the volume of oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 10.5 to obtain the volume of mixed oils in 100 cc. of the Spirit.

Alcohol content—From 65 to 70 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Compound Orange Spirit in tight containers, protected from light.

Orange Syrup

ORANGE SYRUP

Syrupus Aurantii

Syr. Aurant.

Sweet Orange Peel Tincture	50 cc.
Citric Acid	5 Gm.
Talc	15 Gm.
Sucrose	820 Gm.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Triturate the talc with the tincture and citric acid, and gradually add 400 cc. of distilled water. Then filter, returning the first portions of the filtrate until it becomes clear, and wash the mortar and filter with enough distilled water to make the filtrate measure 450 cc. Dissolve the sucrose in this filtrate by agitation, without heating, and add enough distilled water to make the product measure 1000 cc. Mix thoroughly and strain.

This preparation must not be dispensed if it has a terebinthinate odor or taste or shows other indications of deterioration.

Alcohol content—From 2 to 5 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Orange Syrup in tight containers, preferably at a temperature not above 25°.

Ouabain

OUABAIN

Ouabainum

Ouabain.—G-Strophanthin

$C_{29}H_{44}O_{12} \cdot 8H_2O$ **Mol. wt. 728.77**

Ouabain is a glycoside obtained from the seeds of *Strophanthus gratus* (Wall. et Hook.) Baillon (Fam. *Apocynaceæ*).

Caution—Ouabain is extremely poisonous.

Description—Ouabain occurs as white, odorless crystals, or as a crystalline powder. It is stable in air, but is affected by light. Its solutions are neutral to litmus paper. It melts indistinctly and with decomposition at about 190°.
Solubility—One Gm. of Ouabain dissolves slowly in about 75 cc. of water, and in about 100 cc. of alcohol. It is more soluble in hot water and in hot alcohol.
Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Ouabain, determined in a solution containing the equivalent of 1 Gm. of anhydrous Ouabain in 100 cc. of solution, is not less than $-31°$ and not more than $-32.5°$, using a 100-mm. tube, page 675.
Identification—

A: Dissolve about 2 mg. of Ouabain in 2 cc. of sulfuric acid: a color develops which is dark red by transmitted light and shows a greenish fluorescence in reflected light.

B: Heat about 100 mg. of Ouabain with 5 cc. of diluted sulfuric acid until solution is complete, and then boil for 1 or 2 minutes: the solution becomes brownish and a turbidity develops. Cool, filter, add to the filtrate 5 cc. of a solution of sodium hydroxide (1 in 10) and 3 cc. of alkaline cupric tartrate T.S., and boil: a red precipitate of cuprous oxide forms.

Loss on drying—Dry about 200 mg. of Ouabain to constant weight at 130°: the loss in weight corresponds to not less than 18 per cent and not more than 22 per cent.
Residue on ignition—The residue on ignition of 100 mg. of Ouabain is negligible, page 685.
Alkaloids—A solution of Ouabain (1 in 100) yields no precipitate with tannic acid T.S. or with iodine T.S.
Packaging and storage—Preserve Ouabain in tight, light-resistant containers.

AVERAGE DOSE—Intravenous, **0.25 mg.** (approximately 1/250 grain).

Ouabain Injection

OUABAIN INJECTION

Injectio Ouabaini

Inj. Ouabain.

Ouabain Injection is a sterile solution of ouabain in water for injection. The Injection contains, in each cc., the labeled amount of ouabain. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Ouabain Injection preferably by Process D-1 or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Assay—Prepare a *Standard preparation of ouabain* by dissolving U. S. P. Ouabain Reference Standard in sufficient alcohol to make a 1 to 1000 solution with an accuracy within 1 per cent. Preserve this stock solution in a cold place in a tight container of Type 1 glass, page 630, and do not use it for assays after a period of more than 6 months.

Use the Injection as the *preparation to be assayed* and proceed as directed in the *Assay of Digitalis Tincture*, page 173, beginning with the second paragraph, and

substituting the *Standard preparation of ouabain* for the *Standard preparation of digitalis*, deleting the sentence beginning "Express the potency. . . .," and do not use the *test dilutions* after a period of more than 3 hours. Under *Calculation of the potency*, express the lethal dose for each cat in terms of milligrams of ouabain per Kg. of live body weight. Ouabain Injection is considered to conform to the pharmacopœial requirement if the result of the assay does not vary more than 20 per cent from the labeled potency.

NOTE—Because of the difference in water content, 1.0 mg. of U.S.P. Ouabain Reference Standard is the equivalent of 1.1 mg. of official ouabain.

Packaging and storage—Preserve Ouabain Injection preferably in single dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light.

Sizes—Ouabain Injection usually available contains the following amounts of ouabain: 0.25 mg. ($\frac{1}{250}$ grain) in 1 cc.; 0.5 mg. ($\frac{1}{120}$ grain) in 1 cc.

AVERAGE DOSE OF OUABAIN—Intravenous, **0.25 mg.** (approximately $\frac{1}{250}$ grain).

Ox Bile Extract

OX BILE EXTRACT

Extractum Fellis Bovis

Ext. Fel. Bov.—Powdered Oxgall Extract

Ox Bile Extract contains an amount of the sodium salts of ox bile acids equivalent to not less than 45 per cent of cholic acid ($C_{24}H_{40}O_5$).

Description—Ox Bile Extract is a brownish yellow, greenish yellow or brown powder, having a bitter taste.

Solubility—Ox Bile Extract is soluble in water and in alcohol. The solutions foam strongly when shaken.

Reaction—A solution of Ox Bile Extract (1 in 20) is neutral or slightly acid to litmus paper.

Insoluble substances—Dissolve 5 Gm. of Ox Bile Extract in 100 cc. of 80 per cent alcohol, warming if necessary to aid solution. Filter within 15 minutes through a tared filter, and wash with small portions of 80 per cent alcohol until the washings are colorless or nearly so, then dry the insoluble residue at 100° for 1 hour, and weigh. Its weight corresponds to not more than 0.1 per cent of the weight of the Ox Bile Extract used.

Assay—Dissolve 1.0 Gm. of Ox Bile Extract, accurately weighed, in 50 cc. of 60 per cent acetic acid. Filter the solution, if necessary, into a 100-cc. volumetric flask, wash the original container and the filter with small portions of 60 per cent acetic acid, and add to the filtrate sufficient of the acetic acid to make 100 cc., and mix well. Dilute exactly 10 cc. of this solution with sufficient 60 per cent acetic acid to make 100 cc. and mix well.

Transfer exactly 1 cc. of the last dilution to each of two matched test tubes, *A* and *B*, from 15- to 16-mm. in diameter, or to 25-cc. matched glass-stoppered cylinders. To tube *A*, add exactly 1 cc. of water, and to tube *B* add exactly 1 cc. of a freshly prepared solution of furfural (1 cc. in 100 cc.), and place the tubes at once in an ice bath for 5 minutes. Then to each tube add exactly 13 cc. of dilute sulfuric acid, made by cautiously mixing 50 cc. of sulfuric acid with 65 cc. of water. Thoroughly mix the contents of the tubes, and place them in a water bath at 70° for 10 minutes. At the expiration of this period, place the tubes immediately in ice water for 2 minutes.

Determine the per cent of light transmission of the solution in tube *B* in a suitable photoelectric colorimeter with a filter having a maximum transmission at 640 to 680 millimicrons, taking the light transmission of tube *A* as 100 per cent. From the percentage of transmission calculate, by means of the curve prepared with U. S. P. Cholic Acid Reference Standard, as described in the next paragraph, the weight of cholic acid in the quantity of the sample taken for the test.

Prepare the Standard Cholic Acid Reference Curve as follows: Weigh accurately 50 mg. of U. S. P. Cholic Acid Reference Standard, and dissolve it in sufficient 60 per cent acetic acid to make exactly 100 cc., and mix well. Transfer exactly 0.2-, 0.4-, 0.6-, 0.8-, and 1-cc. aliquots of this solution to matched test tubes, or 25-cc. glass-stoppered cylinders, and add sufficient 60 per cent acetic acid to each tube to make exactly 1 cc. To each of the tubes, or cylinders, add exactly 1 cc. of the freshly prepared solution of furfural, and place the tubes in an ice bath for 5 minutes. Then to each tube add exactly 13 cc. of the dilute sulfuric acid described in the second paragraph of the *Assay*. Thoroughly mix the contents of the tubes and place them in a water bath at 70° for 10 minutes. (Allow the tubes to remain in the ice bath until all are mixed and ready for removal to the water bath at the same time.) At the expiration of this period, place the tubes immediately in the ice bath for 2 minutes. Then determine the per cent of light transmission of the solutions in the same colorimeter and at the same wave length as used for the Ox Bile solution. From the data thus obtained prepare the reference curve by plotting the per cent light transmission of the several aliquots on the ordinate scale against the corresponding quantities of cholic acid on the abscissa scale.

Packaging and storage—Preserve Ox Bile Extract in tight containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Ox Bile Extract Tablets

OX BILE EXTRACT TABLETS

Tabellæ Extracti Fellis Bovis

Tab. Ext. Fel. Bov.

Ox Bile Extract Tablets contain an amount of ox bile extract which will yield upon assay a quantity of cholic acid corresponding to not less than 40 per cent of the labeled amount of the extract.

Assay—Weigh a counted number of not less than 20 Ox Bile Extract Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 1 Gm. of ox bile extract, and triturate it in a mortar with 20 cc. of 60 per cent acetic acid for 15 minutes. Decant the liquid through a filter into a 100-cc. volumetric flask. Triturate the residue with 15 cc. of 60 per cent acetic acid for 5 minutes, then transfer the mixture to the filter. Wash the mortar and the filter with small portions of the acetic acid until the filtrate measures about 90 cc., add sufficient 60 per cent acetic acid to make exactly 100 cc., and mix well. Dilute exactly 10 cc. of this solution with sufficient 60 per cent acetic acid to make 100 cc., and mix well. Then proceed as described in the *Assay* under *Ox Bile Extract* beginning with "Transfer exactly 1 cc. of the last dilution to each of two matched test tubes, A and B."

Packaging and storage—Preserve Ox Bile Extract Tablets in tight containers.

Sizes—Ox Bile Extract Tablets usually available contain the following amount of ox bile extract: 0.3 Gm. (5 grains).

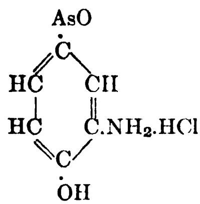
AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains)

Oxophenarsine Hydrochloride

OXOPHENARSINE HYDROCHLORIDE

Oxophenarsinæ Hydrochloridum

Oxophenarsin. Hydrochlor.—3-Amino-4-hydroxyphenylarsinoxide Hydrochloride



$C_6H_6AsO_2N.HCl$ Mol. wt. 235.49

Oxophenarsine Hydrochloride, when dried in a vacuum desiccator over phosphorus pentoxide for 24 hours, contains not less than 30 per cent and not more than 32 per cent of total arsenic (As).

Oxophenarsine Hydrochloride is usually distributed as a mixture with buffering agents and suitable substances to render its solution physiologically compatible with human blood. The label must indicate the names of the admixed substances, and the composition of the mixtures (containing Oxophenarsine Hydrochloride as the only active therapeutic agent) shall be approved by the National Institute of Health. Mixtures contain total arsenic equivalent to not less than 92.5 per cent and not more than 107.5 per cent of the labeled amount of Oxophenarsine Hydrochloride. The mixtures also meet the requirements for *Identification*, *Completeness of solubility*, and *Packaging and storage*.

Oxophenarsine Hydrochloride and its mixtures must be prepared in an establishment licensed for the purpose by the United States Government upon the recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being offered for sale must comply with the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Description—Oxophenarsine Hydrochloride occurs as a white or nearly white, odorless powder.

Solubility—Oxophenarsine Hydrochloride is soluble in water, in solutions of alkali hydroxides and carbonates, and in dilute mineral acids.

Identification—

A: Add 250 mg. of sodium hydrosulfite to about 50 mg. of Oxophenarsine Hydrochloride dissolved in 3 cc. of water: a salmon-colored precipitate which rapidly changes to yellow is formed.

B: Dissolve 10 mg. of Oxophenarsine Hydrochloride in 1 cc. of water, add 1 cc. of hydrochloric acid and 1 drop of hypophosphorous acid: a nearly white to yellow precipitate is produced.

Difference from dichlorophenarsine hydrochloride—Add about 50 mg. of Oxophenarsine Hydrochloride to 5 cc. of acetone contained in a test tube, insert a loose plug of cotton, and boil gently: the escaping vapors do not turn blue litmus paper red.

Loss on drying—When dried in a vacuum desiccator over fresh phosphorus pentoxide for 24 hours, Oxophenarsine Hydrochloride loses not more than 1 per cent of its weight. Mixtures similarly tested lose not more than 0.5 per cent.

Completeness of solubility—Oxophenarsine Hydrochloride is completely soluble in water in a concentration as great as is recommended for its intravenous administration.

Percentage of trivalent arsenic—Proceed as directed under *Dichlorophenarsine Hydrochloride*, page 164. Each cc. of tenth-normal iodine is equivalent to 3.746 mg. of trivalent arsenic. It shows not less than 29.5 per cent and not more than 32 per cent of trivalent arsenic.

Assay for total arsenic—Proceed as directed under *Dichlorophenarsine Hydrochloride*, page 164. Each cc. of tenth-normal potassium bromate is equivalent to 3.746 mg. of arsenic (As), or to 11.77 mg. of Oxophenarsine Hydrochloride.

Packaging and storage—Preserve Oxophenarsine Hydrochloride at a temperature preferably not above 25°, in hermetic containers of colorless glass, which have been sterilized prior to filling, and from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the amount in grams or in milligrams of the Oxophenarsine Hydrochloride contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label on the outside of the container of one or more ampuls must bear the official title, the amount in grams or in milligrams of the Oxophenarsine Hydrochloride contained in the individual ampul, the names of the admixed substances, if any, the lot number of the product, the name and address of the manufacturer, the U. S. license number of the manufacturer, and the expiration date for the product.

Expiration date—The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain quality) shall not be more than 2½ years from the date of release of that lot by the National Institute of Health.

AVERAGE DOSE—Intravenous, **45 mg.** (approximately ¾ grain).

Oxygen

OXYGEN

Oxygenium

Oxygen.

O_2 Mol. wt. 32.00

Oxygen contains not less than 99 per cent by volume of O_2.

Description—Oxygen is a colorless, odorless, tasteless gas, which supports combustion more energetically than air. A liter of Oxygen at a pressure of 760 mm. and at 0° weighs 1.429 Gm.

Solubility—One volume of Oxygen dissolves in about 32 volumes of water and in about 7 volumes of alcohol at 20° and at 760 mm. pressure.

Identification—A glowing splinter of wood held in Oxygen bursts into flame.

Note—Cylinders containing Oxygen must be kept at a temperature of 25° ±2° for at least 6 hours before the Oxygen is withdrawn for the following determinations. Gas volumes for the following tests and assays are to be corrected to a pressure of 760 mm. and a temperature of 25°.

Acids or alkalies—Dilute 0.3 cc. of methyl red T.S. with 400 cc. of boiling water, and boil the solution for 5 minutes. Pour 100 cc. of the boiling solution into each of 3-color-comparator tubes of clear glass, of approximately the same size, and marked "A," "B," and "C," respectively. Add 0.2 cc. of hundredth-normal hydrochloric acid to tube "B," and 0.4 cc. of hundredth-normal hydrochloric acid to tube "C." Stopper each of the tubes, and cool them to room temperature. Pass 2000 cc. of Oxygen through the solution in tube "B" at a rate requiring about 30 minutes for the passage of the gas. The color of the solution in tube "B" is no deeper red than that of the solution in tube "C" and no deeper yellow than that of the solution in tube "A."

Carbon dioxide—Pass 1000 cc. of Oxygen through 50 cc. of barium hydroxide T.S. The test solution must be devoid of turbidity prior to the test. Regulate the flow so as to require 15 minutes for the delivery of 1000 cc. of gas. The delivery tube must have an orifice of approximately 1 mm. in diameter, and must extend to within 2 mm. of the bottom of the vessel containing the barium hydroxide solution. The vessel employed must give a hydrostatic column of from 12 to 14 cm. with the 50 cc. of the solution. The turbidity produced, if any, does not exceed that produced when 1 cc. of a solution, prepared by dissolving 100 mg. of sodium bicarbonate in 100 cc. of freshly boiled and cooled water, is added to another 50-cc. portion of barium hydroxide T.S. under the prescribed conditions.

Other oxidizing substances—Pass 2000 cc. of Oxygen, under conditions comparable to those in the test for *Carbon dioxide*, through 15 cc. of freshly prepared starch-potassium iodide T.S. to which has been added 1 drop of glacial acetic acid. The color of the test solution is not altered by the passage of the Oxygen, as shown by comparing it with another portion of the acidified starch-potassium iodide T.S. through which the gas has not been passed.

Halogens—Pass 2000 cc. of Oxygen, under conditions comparable to those in the test for *Carbon dioxide*, through a mixture of 100 cc. of water and 1 cc. of silver nitrate T.S. The liquid shows no greater degree of opalescence than does a mixture of 100 cc. of water and 1 cc. of silver nitrate T.S., prepared at the same time as that through which the gas passes, the observation being made in 100-cc., low-form Nessler tubes which are closely similar in all respects.

Carbon monoxide—Oxygen meets the requirements of the test for *Carbon Monoxide in Oxygen*, page 626. Nitrogen which is negative to the test for *Carbon monoxide*, under *Ethylene*, page 213, shall be considered as carbon monoxide-free for the purpose of this test.

Assay—Place a sufficient quantity of mercury in a 100-cc. calibrated nitrometer, provided with a two-way stopcock and a two-way outlet, and properly connected with a balancing tube. Connect one of the outlet tubes of the nitrometer with a gas pipette of suitable capacity. Place in the pipette a coil of copper wire which extends to the uppermost portion of the bulb, and add about 125 cc. of ammonium chloride-ammonium hydroxide T.S. Draw the liquid (free from air bubbles) through the capillary opening connection and stopcock opening in the nitrometer by reducing the pressure in the nitrometer tube and opening the stopcock controlling the connection with the gas pipette. Then close the stopcock. Having completely filled the nitrometer, the other stopcock opening, and the other intake tube with mercury, draw into the nitrometer exactly 100 cc. of Oxygen by reducing the pressure in the tube. Close this stopcock. Increase the pressure on the Oxygen in the nitrometer tube, and open the stopcock controlling the connection with the gas pipette. Force the entire volume of gas into the pipette. Close the

stopcock, and rock the pipette gently, providing frequent contact of the liquid, gas, and copper spiral. At the end of 15 minutes most of the gas will have been absorbed by the liquid. At this time, to facilitate the absorption of the last portion of the Oxygen, draw some of the liquid into the nitrometer tube, and force the residual gas back upon the surface of the liquid in the gas pipette. Again rock the pipette until no further diminution in the volume of the gas occurs. Draw the residual gas, if any, into the nitrometer tube, and measure its volume.

The volume of gas remaining undissolved does not exceed 1 cc.

Packaging and storage—Preserve Oxygen in tight containers.

Pancreatin

PANCREATIN

Pancreatinum

Pancreat.

Pancreatin is a substance containing enzymes, principally pancreatic amylase, trypsin, and pancreatic lipase, obtained from the fresh pancreas of the hog, *Sus scrofa* Linné var. *domesticus* Gray (Fam. *Suidæ*) or of the ox, *Bos taurus* Linné (Fam. *Bovidæ*). Pancreatin converts not less than 25 times its weight of U. S. P. Potato Starch Reference Standard into soluble carbohydrates, and not less than 25 times its weight of casein into proteoses. Pancreatin of a higher digestive power may be brought to this standard by admixture with lactose, or with sucrose containing not more than 3.25 per cent of starch, or with pancreatin of lower digestive power.

Description—Pancreatin is a cream-colored, amorphous powder, having a faint, characteristic, but not offensive odor.

Solubility—Pancreatin is slowly and incompletely soluble in water; it is insoluble in alcohol.

Identification—Pancreatin changes protein into proteoses and derived substances, and converts starch into dextrins and sugars. Its greatest activities are in neutral or faintly alkaline media; more than traces of mineral acids or large amounts of alkali hydroxides render it inert. An excess of alkali carbonate also inhibits its action.

Fat—Introduce 2 Gm. of Pancreatin into a flask of about 50-cc. capacity, add 20 cc. of ether, stopper, and set it aside for several hours, mixing by rotating at frequent intervals. Decant the supernatant ether by means of a guiding rod into a plain filter of about 7-cm. diameter, previously moistened with ether, and collect the filtrate in a tared beaker. To the residue remaining in the flask add a further portion of 10 cc. of ether, proceeding as directed before, then a third portion of 10 cc. of ether, and transfer the ether and the remainder of the Pancreatin to the filter. Allow to drain, evaporate the ether spontaneously, and dry the residue to constant weight at 100°: the residue of fat weighs not more than 60 mg.

Assay for starch digestive power—Determine the percentage of moisture in U. S. P. Potato Starch Reference Standard by drying about 500 mg., accurately weighed, at 120° for 4 hours. Boil a sufficient amount of water for 10 minutes, and cool to room temperature. Use this water for all dilutions hereinafter specifying water. Thoroughly mix a quantity of the U. S. P. Potato Starch Reference Standard, equivalent to 3.75 Gm. of dry Reference Standard, with 10 cc. of water. Add the

mixture, with constant stirring, to 75 cc. of water, previously heated to about 55°, and contained in a tared, 250-cc. beaker. Rinse the remaining starch into the beaker with 10 cc. of water. Heat the mixture to boiling, and boil it gently, with constant stirring, for 5 minutes. Add enough water to make the mixture weigh 100 Gm., cool the paste to 40°, and place the beaker in a water bath maintained at 40°. Suspend 150 mg. of Pancreatin in 5 cc. of water in a 250-cc. beaker and add the suspension to the starch paste, mixing it well by pouring the mixture from beaker to beaker for 30 seconds, noting the time when the Pancreatin suspension was first added to the starch. Maintain the mixture at a temperature of 40° for exactly 5 minutes. Stir, and at once add 0.1 cc. of this mixture to a previously made mixture of 0.2 cc. of tenth-normal iodine and 60 cc. of water, at a temperature of from 23° to 25°: no blue or violet color is produced.

Assay for casein digestive power—Place 100 mg. of finely powdered casein in a 50-cc. volumetric flask, add 30 cc. of water, and shake well to bring the casein into suspension. Add exactly 1 cc. of tenth-normal sodium hydroxide, and heat the mixture at 40° until the casein is completely dissolved, which should not require more than 30 minutes. Cool, add sufficient water to make 50 cc., and mix well. Dissolve 100 mg. of Pancreatin in 500 cc. of water. Mix 1 cc. of glacial acetic acid with 9 cc. of water and 10 cc. of alcohol. Place 5 cc. of the casein solution in a test tube, add to it 2 cc. of the well-shaken Pancreatin solution and 3 cc. of water, and mix by gentle agitation. Immediately immerse the test tube in a water bath at 40°, and keep it at this temperature for 1 hour. Then remove it from the bath, and add 3 drops of the acetic acid mixture: no precipitate is produced.

Storage—Preserve Pancreatin in tight containers, preferably at a temperature not above 30°.

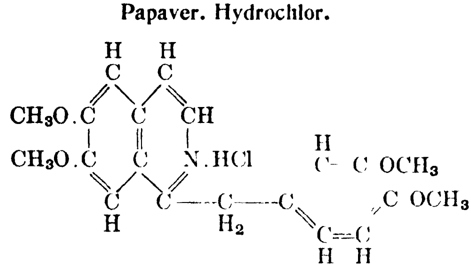
AVERAGE DOSE—**0.5 Gm.** (approximately 7½ grains).

Papaverine Hydrochloride

PAPAVERINE HYDROCHLORIDE

Papaverinæ Hydrochloridum

Papaver. Hydrochlor.



$C_{20}H_{21}NO_4.HCl$ Mol. wt. 375.84

Papaverine Hydrochloride is the hydrochloride of an alkaloid obtained from opium or prepared synthetically.

Description—Papaverine Hydrochloride occurs as white crystals or as a white, crystalline powder. It is odorless, and has a slightly bitter taste. It is optically inactive. Its solutions are acid to litmus paper.

Solubility—One Gm. of Papaverine Hydrochloride is soluble in about 30 cc. of water. It is soluble in alcohol and in chloroform, but is practically insoluble in ether.

Identification—

A: A solution of Papaverine Hydrochloride (1 in 50) responds to the tests for *Chloride*, page 659.

B: A solution of Papaverine Hydrochloride (1 in 50) yields precipitates with mercury bichloride T.S., iodine T.S., potassium ferricyanide T.S., and picric acid T.S.

C: Dissolve about 100 mg. of Papaverine Hydrochloride in 10 cc. of water, add a slight excess of ammonia T.S., and shake with 10 cc. of ether. Separate the ether from the water layer, wash it by shaking with 5 cc. of water, and filter the separated ether layer through filter paper moistened with ether. Evaporate the ether solution at a low temperature, and dry the residue at 100°. The melting point of the papaverine thus obtained is between 145° and 148°, page 667.

D: Dissolve about 1 mg. of Papaverine Hydrochloride in 0.1 cc. of sulfuric acid containing 1 drop of formaldehyde T.S. in each cc.: a colorless or a faintly yellowish green solution is produced. This gradually changes to deep rose and finally becomes brown (*difference from morphine and its esters, which give purple or violet colors*).

Loss on drying—When dried for 24 hours over sulfuric acid, Papaverine Hydrochloride loses not more than 1 per cent of its weight.

Residue on ignition—Papaverine Hydrochloride yields not more than 0.5 per cent of residue on ignition, page 685.

Cryptopine, thebaine, or other organic impurities—Dissolve 50 mg. of Papaverine Hydrochloride in 2 cc. of sulfuric acid: the color of the resulting solution is not deeper than pale pink, or not more than slightly brown.

Morphine—Dissolve about 10 mg. of Papaverine Hydrochloride in 10 cc. of water, add a few drops of hydrochloric acid and a few drops of a saturated solution of iodine pentoxide, and shake the mixture with 5 cc. of carbon tetrachloride: the carbon tetrachloride layer is not colored violet.

Packaging and storage—Preserve Papaverine Hydrochloride in tight, light-resistant containers.

AVERAGE DOSE—Oral and intravenous, **0.1 Gm.** (approximately 1½ grains).

Papaverine Hydrochloride Injection

PAPAVERINE HYDROCHLORIDE INJECTION

Injectio Papaverinæ Hydrochloridi

Inj. Papaver. Hydrochlor.

Papaverine Hydrochloride Injection is a sterile solution of papaverine hydrochloride in water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_{20}H_{21}NO_4.HCl$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Papaverine Hydrochloride Injection preferably by Process C. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Papaverine Hydrochloride Injection responds to *Identification tests A, B,* and *C* under *Papaverine Hydrochloride,* page 376. The residue obtained in the assay melts between 145° and 148°, page 667, and responds to *Identification test D* under *Papaverine Hydrochloride.*

Assay—Transfer to a separator an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers,* page 665, equivalent to about 120 mg. of papaverine hydrochloride, and dilute with water to 20 cc. Render alkaline with ammonia T.S., and completely extract the alkaloid by shaking first with 30 cc., then with successive 15-cc. portions of chloroform. Wash the combined chloroform extracts with 10 cc. of water, then filter the chloroform solution through a filter paper moistened with chloroform, and wash the separator and filter with two 5-cc. portions of chloroform. Evaporate the chloroform solution on a steam bath to about 2 cc. with the aid of a current of air, add 10 cc. of alcohol, evaporate to dryness on a steam bath, and dry at 100° for 2 hours. The weight of the papaverine alkaloid so obtained, multiplied by 1.107, represents the equivalent weight of $C_{20}H_{21}NO_4.HCl$.

Packaging and storage—Preserve Papaverine Hydrochloride Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections,* page 630.

Sizes—Papaverine Hydrochloride Injection usually available contains the following amount of papaverine hydrochloride: 30 mg. (½ grain) in 1 cc.

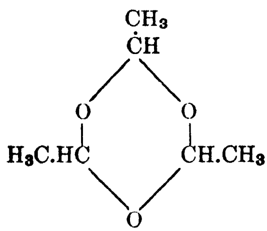
AVERAGE DOSE OF PAPAVERINE HYDROCHLORIDE—Intravenous, **0.1 Gm.** (approximately 1½ grains).

Paraldehyde

PARALDEHYDE

Paraldehydum

Paraldehyd.—Paracetaldehyde



$C_6H_{12}O_3$ Mol. wt. 132.16

Description—Paraldehyde is a colorless, transparent liquid. It has a strong, characteristic, but not unpleasant or pungent odor, and a disagreeable taste. Its specific gravity is about 0.99.

Solubility—One cc. of Paraldehyde dissolves in about 8 cc. of water, and in about 17 cc. of boiling water. It is miscible with alcohol, chloroform, ether, and with volatile oils.

Distillation range—Paraldehyde distils between 120° and 126°, page 624.

Congealing temperature—Paraldehyde congeals at a temperature not below 11°, page 629.

Identification—When heated with a small quantity of diluted sulfuric acid, Paraldehyde is converted into acetaldehyde, recognizable by its odor.

Acid—A mixture of 6 cc. of Paraldehyde with 100 cc. of water and 5 drops of phenolphthalein T.S. acquires a pink color on the addition of not more than 0.5 cc. of normal sodium hydroxide.

Residue on evaporation—Heat 5 cc. of Paraldehyde in a small tared evaporating dish on a water bath: no disagreeable odor is noticeable as the last portions evaporate and not more than 3 mg. of residue remains.

Chloride—To 5 cc. of a solution of Paraldehyde (1 in 10), add 1 drop of nitric acid and 3 drops of silver nitrate T.S.: no opalescence is produced at once.

Sulfate—To 5 cc. of a solution of Paraldehyde (1 in 10) add 1 drop of hydrochloric acid and 3 drops of barium chloride T.S.: no turbidity is produced.

Amyl alcohol—One cc. of Paraldehyde with 10 cc. of water, at 25°, gives a clear solution, free from oily drops.

Acetaldehyde—Place 100 cc. of water in a 300-cc. Erlenmeyer flask, add 5 cc. of Paraldehyde, and shake the mixture gently until solution is complete. Add 5 cc. of a solution of hydroxylamine hydrochloride (made by dissolving exactly 3.5 Gm. of hydroxylamine hydrochloride in sufficient water to make 100 cc.). Shake the mixture gently for 30 seconds, add 2 drops of methyl orange T.S., and titrate immediately with half-normal sodium hydroxide. Perform a blank test with the same quantities of the same reagents, and in the same manner: the difference between the determinations does not exceed 1 cc. of half-normal sodium hydroxide.

Packaging and storage—Preserve Paraldehyde in well-filled, tight, light-resistant containers which hold not more than 120 Gm., preferably at a temperature not above 30°.

AVERAGE DOSE—**4 cc.** (approximately 1 fluidrachm).

Parathyroid Injection

PARATHYROID INJECTION

Injectio Parathyroidei

Inj. Parathyroid.—Parathyroid Solution, Parathyroid Extract

Parathyroid Injection is a sterile solution in water for injection of the water-soluble principle or principles of the parathyroid glands which have the property of relieving the symptoms of parathyroid tetany and of increasing the calcium content of the blood serum in man and other animals. It is obtained from the fresh parathyroid glands of healthy domesticated animals used for food by man, the animal source of each preparation being stated. The parathyroid glands must be removed from the animals immediately after slaughtering, and then extracted at once or kept frozen until extracted. The glands are freed from gross fat and connective tissue, ground, extracted, and the extract purified to make it suitable for parenteral administration. The Injection is then adjusted to the proper potency. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Parathyroid Injection preferably by Process F. See *Sterilization Processes*, page 692.

One cc. of Parathyroid Injection possesses a potency of not less than 100 U.S.P. Parathyroid Units, each Unit representing one one-hundredth of the amount required to raise the calcium content of 100 cc. of the

blood serum of normal dogs 1 mg. within 16 to 18 hours after administration.

The Injection also conforms to the other requirements under *Injections*, page 664, except at times it may show signs of a slight turbidity or precipitate.

Assay—Select male dogs free from gross evidence of disease and accustomed to venipuncture, but which have not been used during the previous 4 weeks for the purposes of this assay. The dogs shall be mature, as determined by the presence of their second teeth, and shall weigh between 8 and 16 Kg. No two dogs selected shall differ in weight by more than 5 Kg. On account of individual variation in reaction, a group of not less than ten dogs is to be employed in each test. During the assay, maintain the dogs under similar conditions with respect to diet and environmental influences.

Select, by preliminary trial, a dose of the preparation to be assayed such that its injection will be expected to produce increases in the serum calcium contents of the dogs selected of not less than 2 mg. and not more than 5 mg. per 100 cc. of serum.

Withdraw a blood sample from each dog, taking precautions to avoid exciting the dog and thereby elevating the serum calcium level. In obtaining the blood samples, use a clean, dry syringe containing no anti-coagulant. Transfer the blood immediately to a centrifuge tube, and allow the blood to clot. Free the clot with a glass rod, and centrifuge sufficiently to yield the serum as a clear supernatant layer which may be siphoned off by suitable means. It may be necessary to re-centrifuge the serum after its separation from the clot in order to insure the removal of all cellular material. Determine the serum calcium by the method indicated below.

Inject subcutaneously into each dog the selected dose of the Injection to be tested. Between 16 and 18 hours after the injection again withdraw a blood sample, observing the same precautions, and determine the serum calcium as indicated.

Determine for each dog the increase in serum calcium (expressed in mg. per 100 cc. of serum) per cc. of preparation injected, and determine the average of these values for all of the animals injected. The potency of the preparation is satisfactory if the average of the ten or more values so obtained is not less than 1 mg. of calcium per 100 cc. of serum, per 1 cc. of the Injection.

Determination of serum calcium—Perform this determination in duplicate. Place 2 cc. of clear serum in a graduated 15-cc. conical centrifuge tube that has very recently been thoroughly cleaned with *chromic acid cleansing mixture*, page 628. Add 2 cc. of water and 1 cc. of ammonium oxalate T.S., dropping the latter directly into the solution and not allowing it to touch the lip or sides of the tube. Mix thoroughly by giving the tube a quick, jerky, whirling motion. Stopper the tube, and allow it to stand for 30 minutes. Again mix the contents, and centrifuge for about 5 minutes at 1500 or more revolutions per minute. Carefully decant the supernatant liquid, and allow the inverted tube to drain in a rack for 5 minutes, with the mouth of the tube resting on a pad of filter paper. Dry the mouth of the tube, while it is still inverted, with a soft cloth. Place the tube in an upright position. Stir the precipitate, and wash the sides of the tube with 3 cc. of ammonia solution (made by mixing 2 cc. of stronger ammonia T.S. with 98 cc. of water) directed in a very fine stream from a wash bottle. Centrifuge the suspension, decant the supernatant liquid, drain for 5 minutes, and again dry the mouth of the tube. Add 2 cc. of approximately normal sulfuric acid, blowing it from a pipette directly upon the precipitate so as to break up the mat and facilitate solution. Place the tube and contents in boiling water for about 1 minute and titrate with hundredth-normal potassium permanganate to a definite pink color which persists for at least 1 minute. During the course of the titration maintain the contents of the tube at a temperature of from 70° to 75°. Add the permanganate solution from a microburette graduated in 0.02-cc. divisions and having a tip of

sufficiently fine bore to permit the addition of as little as 0.01 cc. of solution at a time. If the duplicate determinations do not agree within 0.04 cc. of the permanganate solution, repeat the determination. Perform a blank titration, using 2 cc. of the same sulfuric acid used to dissolve the precipitate, and make appropriate correction. Each cc. of hundredth-normal potassium permanganate is equivalent to 0.20 mg. of calcium (Ca).

Packaging and storage—Preserve Parathyroid Injection in a cold place, preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Parathyroid Injection usually available contains the following equivalent of parathyroid: 100 U. S. P. Units in 1 cc.

AVERAGE DOSE OF PARATHYROID—Intramuscular, 25 U. S. P. Units.

PEANUT OIL

Oleum Arachidis

Ol. Arach.—Arachis Oil

Peanut oil is the fixed oil obtained by cold pressure from the peeled seeds of one or more of the cultivated varieties of *Arachis hypogæa* Linné (Fam. *Leguminosæ*).

Description—Peanut Oil is a colorless or pale yellow, oily liquid with a bland taste. It may have a characteristic, nutty odor.

Solubility—Peanut Oil is very slightly soluble in alcohol. It is miscible with ether, with chloroform, and with carbon disulfide.

Specific gravity—The specific gravity of Peanut Oil is not less than 0.912 and not more than 0.920.

Refractive index—The refractive index of Peanut Oil is not less than 1.4625 and not more than 1.4645 at 40°, page 682.

Identification—Saponify 5 Gm. of Peanut Oil by boiling with 2.5 cc. of sodium hydroxide solution (3 in 10) and 12.5 cc. of alcohol. Evaporate the alcohol, dissolve the soap in 50 cc. of hot water, and add diluted hydrochloric acid until the free fatty acids separate as an oily layer. Allow the mixture to cool, remove the separated fatty acids, and dissolve them in 75 cc. of ether. To the ether solution add a hot solution of 4 Gm. of lead acetate in 40 cc. of alcohol, and allow the mixture to stand for 12 hours. Decant the supernatant liquid through a filter, then transfer the precipitate to the filter with the aid of ether. Heat the contents of the filter with 40 cc. of diluted hydrochloric acid and 20 cc. of water until the oily layer is entirely clear, cool, decant the water solution, and boil the fatty acids with water which has been acidified with hydrochloric acid until free from lead. (The fatty acids are free from lead when 100 mg., dissolved in 10 cc. of alcohol, is not darkened by the addition of 2 drops of sodium sulfide T.S.) Allow the fatty acids to solidify, and press them dry between filter papers on a cold surface. Dissolve the solid fatty acids in 25 cc. of 90 per cent alcohol with the aid of gentle heat, then cool to 15° and maintain at that temperature until the fatty acids have crystallized. When recrystallized from 90 per cent alcohol and dried in a vacuum desiccator, the arachidic acid so obtained melts between 74° and 76°, page 667.

Cottonseed oil—Mix 5 cc. of Peanut Oil in a test tube with 5 cc. of a mixture of equal volumes of amyl alcohol and a solution of sulfur in carbon disulfide (1 in 100), warm the mixture carefully until the carbon disulfide is expelled, and immerse the test

tube to one-third of its length in a boiling, saturated solution of sodium chloride: the mixture develops no reddish color within 2 hours.

Rancidity—Shake 1 cc. of a solution of Peanut Oil in ether (1 in 10) with 1 cc. of hydrochloric acid, and add 1 cc. of a solution of phloroglucinol in ether (1 in 1000): no red or pink color develops.

Free fatty acid—The free fatty acids in 10 Gm. of Peanut Oil require for neutralization not more than 1.0 cc. of tenth-normal sodium hydroxide, page 646.

Iodine value—The iodine value of Peanut Oil is not less than 88 and not more than 98, page 647.

Saponification value—The saponification value of Peanut Oil is not less than 186 and not more than 194, page 647.

Solidification temperature of fatty acids—The solidification temperature of the mixed fatty acids obtained from Peanut Oil is not below 22° and not above 33°, page 645.

Packaging and storage—Preserve Peanut Oil in tight, light-resistant containers and avoid excessive temperatures.

Penicillin Calcium

PENICILLIN CALCIUM

Penicillinum Calcicum

Penicill. Calc.

Penicillin Calcium is the calcium salt of an antibiotic substance or substances produced by the growth of *Penicillium notatum* Westling, or of *Penicillium chrysogenum* Thom (Fam. *Aspergillaceæ*), or produced by any other means. It complies with the requirements of the Federal Food and Drug Administration.

Description—Penicillin Calcium occurs as a white to brown powder, or as granules or scales, sometimes adhering to the container. It is odorless or has a slight, characteristic odor. Penicillin Calcium as usually available is hygroscopic, but the highly purified product does not readily absorb moisture. It is not affected by light but is adversely affected by exposure to temperatures above 25°. In solution at room temperature it loses potency but solutions stored below 5° will remain stable for about 10 days.

Penicillin Calcium is precipitated from its solution by acids and is rapidly inactivated. It is also precipitated by the salts of many of the heavy metals. Oxidizing agents also destroy its activity. A solution of Penicillin Calcium (1 in 100) responds to the tests for *Calcium*, page 659.

Solubility—Penicillin Calcium is very soluble in water, in isotonic sodium chloride solution, and in dextrose solutions. It is also soluble in alcohol, but is inactivated by this solvent, by glycerin, and by many other alcohols.

Potency—

Penicillin Calcium for injection—Its potency is not less than 500 units* for each mg., except when it contains not less than 90 per cent of a salt of penicillin X its potency is not less than 350 units for each mg. When used for preparing *Penicillin Injection in Oil and Wax*, the Penicillin Calcium must have a minimum potency of 750 units in each mg. for concentrations of 100,000 to 200,000 units in each cc..

* The term "unit" means the penicillin activity contained in 0.6 microgram of the Penicillin Master Standard. The term "Master Standard" means a specific lot of crystalline sodium penicillin G (sodium penicillin II) which is designated by the Federal Food and Drug Administration as the standard of comparison in determining the potency of the "Working Standard."

and a minimum potency of 900 units for each mg. for concentrations of 300,000 units in each cc. It complies with the requirements of the Federal Food and Drug Administration for sterility, nontoxicity, freedom from pyrogen, moisture, clarity and pH of solution, packaging, and labeling.

Penicillin Calcium for oral administration (as for making tablets, troches, or dental cones)—Its potency is not less than 300 units for each mg. It complies with the requirements of the Federal Food and Drug Administration for nontoxicity, moisture, packaging, and labeling.

Packaging and storage—Preserve Penicillin Calcium in hermetic or other suitable containers at a temperature not above 15°.

AVERAGE DAILY DOSE—Oral, on a fasting stomach, 300,000 units. Intramuscular, 300,000 units.

Penicillin Sodium

PENICILLIN SODIUM

Penicillinum Sodicum

Penicill. Sod.

Penicillin Sodium is the sodium salt of an antibiotic substance or substances produced by the growth of *Penicillium notatum* Westling, or of *Penicillium chrysogenum* Thom (Fam. *Aspergillaceæ*), or produced by any other means. It complies with the requirements of the Federal Food and Drug Administration.

Description—Penicillin Sodium occurs as a powder, or as granules or scales, sometimes adhering to the container. It is white to brown in color, is odorless or has a slight, characteristic odor. Penicillin Sodium as usually available is hygroscopic, but a highly purified product does not readily absorb moisture. It is not affected by light, but is adversely affected by exposure to temperatures above 25°. In solution at room temperature it loses potency but solutions stored below 5° will remain stable for about 10 days.

Penicillin Sodium is precipitated from its solution by acids and is rapidly inactivated. It is also precipitated by the salts of many of the heavy metals. Oxidizing agents also destroy its activity.

Solubility—Penicillin Sodium is very soluble in water, in isotonic sodium chloride solution, and in dextrose solutions. It is also soluble in alcohol, but is inactivated by this solvent, by glycerin, and by many other alcohols.

Potency—

Penicillin Sodium for injection—Its potency is not less than 500 units* for each mg., except when it contains not less than 90 per cent of a salt of penicillin X its potency is not less than 350 units for each mg. It complies with the requirements of the Federal Food and Drug Administration for sterility, nontoxicity, freedom from pyrogen, moisture, clarity and pH of solution, packaging, and labeling.

Pencillin Sodium for oral administration (as for making tablets or troches)—Its potency is not less than 300 units for each mg. It complies with the requirements

* The term "unit" means the penicillin activity contained in 0.6 microgram of the Penicillin Master Standard. The term "Master Standard" means a specific lot of crystalline sodium penicillin G (sodium penicillin II) which is designated by the Federal Food and Drug Administration as the standard of comparison in determining the potency of the "Working Standard."

of the Federal Food and Drug Administration for nontoxicity, moisture, packaging, and labeling.
Packaging and storage—Preserve Penicillin Sodium in hermetic or other suitable containers at a temperature not above 15°.

AVERAGE DAILY DOSE—Oral, on a fasting stomach, 300,000 units. Intramuscular, 300,000 units.

Penicillin Dental Cones

PENICILLIN DENTAL CONES

Denticoni Penicillini

Denticon. Penicill.

Pencillin Dental Cones are composed of penicillin calcium and suitable harmless diluents, binders, and lubricants, with or without sulfanilamide or sulfathiazole or both, as approved by the Federal Food and Drug Administration.

Penicillin Dental Cones also comply with the requirements of the Federal Food and Drug Administration for potency, moisture, packaging, and labeling.

Packaging and storage—Preserve Penicillin Dental Cones at a temperature not above 15°.
Sizes—Penicillin Dental Cones usually available contain the following in each cone: penicillin, 1000 units and 5000 units; sulfanilamide 30 mg. and 60 mg. (approximately ½ and 1 grain).

AVERAGE DOSE—1 cone.

Penicillin Injection in Oil and Wax

PENICILLIN INJECTION IN OIL AND WAX

Injectio Penicillini in Oleo et Cera

Inj. Penicill. in Ol. et Cer.

Penicillin Injection in Oil and Wax is a sterile suspension of penicillin calcium in a menstruum of peanut oil, or sesame oil, in which white wax is dispersed. The penicillin calcium used in this Injection meets the special requirements under *Penicillin Calcium* for injections in oil and wax, page 382.

Penicillin Injection in Oil and Wax complies with the requirements of the Federal Food and Drug Administration.

Packaging and storage—Preserve Penicillin Injection in Oil and Wax in hermetic or other suitable containers, at a temperature not above 15°.
Sizes—Penicillin Injection in Oil and Wax usually available contains the following amounts of penicillin: 100,000 units in 1 cc.; 200,000 units in 1 cc.; 300,000 units in 1 cc.

AVERAGE DAILY DOSE OF PENICILLIN—Intramuscular, 300,000 units.

Penicillin Ointment

PENICILLIN OINTMENT
Unguentum Penicillini
Ung. Penicill.

Penicillin Ointment contains penicillin calcium in an ointment base approved by the Federal Food and Drug Administration.

Penicillin Ointment complies with the requirements of the Federal Food and Drug Administration.

Packaging and storage—Preserve Penicillin Ointment in collapsible tubes at a temperature not above 15°.

Penicillin Tablets

PENICILLIN TABLETS
Tabellae Penicillini
Tab. Penicill.

Penicillin Tablets contain penicillin calcium or penicillin sodium buffered with calcium carbonate, anhydrous sodium citrate, aluminum hydroxide, or other buffers approved by the Federal Food and Drug Administration.

Penicillin Tablets comply with the requirements of the Federal Food and Drug Administration.

Packaging and storage—Preserve Penicillin Tablets in hermetic or in tight containers at a temperature not above 15°.
Sizes—Penicillin Tablets usually available contain the following amounts of penicillin: 20,000 and 25,000 units.

AVERAGE DAILY DOSE OF PENICILLIN—On a fasting stomach, 300,000 units.

Penicillin Troches

PENICILLIN TROCHES

Trochisci Penicillini

Troch. Penicill.

Penicillin Troches are composed of penicillin calcium, or penicillin sodium, or both, and one or more suitable and harmless diluents, binders, lubricants, masticatory substances, coloring, and flavoring, approved by the Federal Food and Drug Administration.

Penicillin Troches comply with the requirements of the Federal Food and Drug Administration.

Packaging and storage—Preserve Penicillin Troches in hermetic, or in tight containers at a temperature not above 15°.

Sizes—Penicillin Troches usually available contain the following amounts of penicillin: 500, 1000, and 20,000 units.

AVERAGE DOSE—One Troche.

Pentavalent Gas Gangrene Antitoxin.. PAGE 227

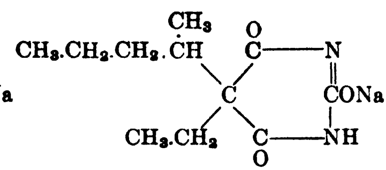
Pentobarbital Sodium

PENTOBARBITAL SODIUM

Pentobarbitalum Sodicum

Pentobarb. Sod.—Soluble Pentobarbital

$C_{11}H_{17}N_2O_3Na$



Mol. wt. 248.26

Pentobarbital Sodium contains not less than 90 per cent and not more than 92 per cent of pentobarbital ($C_{11}H_{18}N_2O_3$), calculated on a moisture-free basis, corresponding to not less than 98.8 per cent of $C_{11}H_{17}N_2O_3Na$.

Description—Pentobarbital Sodium occurs as white, crystalline granules, or as a white powder. It is odorless, and has a slightly bitter taste. Its solutions are alkaline to litmus paper and to phenolphthalein T.S.

Solubility—Pentobarbital Sodium is very soluble in water, and is freely soluble in alcohol, but practically insoluble in ether.

Identification—

A: Add a slight excess of diluted hydrochloric acid to 5 cc. of a solution of Pentobarbital Sodium (1 in 10): a white precipitate of pentobarbital is produced.

B: Dissolve about 300 mg. of Pentobarbital Sodium in 10 cc. of water, and divide into two portions. To one portion add 1 cc. of mercury bichloride T.S.: a white precipitate results, soluble in an excess of ammonia T.S. To the other portion add 5 cc. of silver nitrate T.S.: a white precipitate results, soluble in an excess of ammonia T.S.

C: Ignite about 500 mg. of Pentobarbital Sodium: the residue, when moistened with water, effervesces upon the addition of diluted hydrochloric acid, and responds to the tests for *Sodium*, page 663.

D: The residue of pentobarbital obtained in the *Assay* melts between 126° and 130°, page 667.

Loss on drying—When dried at 90° for 6 hours, Pentobarbital Sodium loses not more than 5 per cent of its weight.

Heavy metals—Dissolve 2 Gm. of Pentobarbital Sodium in 40 cc. of water. Add slowly, with stirring, 10 cc. of normal hydrochloric acid, allow to stand for several minutes, and filter. The heavy metals limit, page 657, for Pentobarbital Sodium, determined in 25 cc. of the filtrate, is 30 parts per million.

Readily carbonizable substances—Dissolve 500 mg. of Pentobarbital Sodium in 5 cc. of sulfuric acid: at the end of 5 minutes the solution has no more color than matching fluid B, page 680.

Free pentobarbital—Place about 1 Gm. of Pentobarbital Sodium, accurately weighed, in a glass-stoppered cylinder, add 50 cc. of absolute ether, stopper, and shake the mixture for 10 minutes. Decant the supernatant liquid through filter paper into a tared beaker, and repeat the extraction twice, using 25 cc. and 15 cc. of ether, respectively, and the same filter. Carefully evaporate the combined filtrates to dryness, and dry the residue to constant weight at 90°: the weight of the residue does not exceed 0.5 per cent of the weight of the Pentobarbital Sodium taken.

Assay—Dissolve about 500 mg. of Pentobarbital Sodium, accurately weighed, in 15 cc. of water in a separator, add to the solution 2 cc. of hydrochloric acid, shake well, and completely extract the liberated pentobarbital with 25-cc. portions of chloroform. Test for completeness of extraction by extracting with an additional 10-cc. portion of chloroform and evaporating the solvent: not more than 0.5 mg. of residue remains. Wash the combined extracts with two portions of 5 cc. each of water, and extract the combined water washings with two 5-cc. portions of chloroform. Filter the combined extracts through a pledget of cotton, or other suitable filter, into a tared beaker, and wash the separator and the filter with several small portions of chloroform. Evaporate the combined filtrate and washings on a steam bath with the aid of a current of air, dry the residue of $C_{11}H_{18}N_2O_3$ at 100° for 2 hours, cool and weigh.

Packaging and storage—Preserve Pentobarbital Sodium in tight containers.

AVERAGE DOSE—**0.1 Gm.** (approximately 1½ grains).

Pentobarbital Sodium Capsules

PENTOBARBITAL SODIUM CAPSULES

Capsulæ Pentobarbitali Sodici

Cap. Pentobarb. Sod.—Soluble Pentobarbital Capsules

Pentobarbital Sodium Capsules contain not less than 90 per cent and not more than 105 per cent of the labeled amount of $C_{11}H_{17}N_2O_3Na$.

Identification—

A: Dissolve the contents of a sufficient number of the capsules, equivalent to about 2 Gm. of pentobarbital sodium, in 25 cc. of water, and filter the solution. To 10 cc. of the filtrate add a slight excess of diluted hydrochloric

acid: a white precipitate is formed. Collect the precipitate on a filter, wash it with cold water until the washings are free from chloride, and dry at about 80°. The melting range of the pentobarbital so obtained is between 125° and 130°, page 667.

B: A 10-cc. portion of the filtrate obtained in the preceding test responds to *Identification test B* under *Pentobarbital Sodium*, page 386.

C: Ignite the contents of Pentobarbital Sodium Capsules: the residue effervesces with acids, and responds to the tests for *Sodium*, page 663.

Assay—Transfer as completely as possible the contents of a counted number of not less than 20 of the Pentobarbital Sodium Capsules to a 200-cc. volumetric flask. Place the emptied capsules in a beaker, add sufficient cold water to cover them, and allow to stand for 10 minutes with frequent agitation. Filter into the volumetric flask, and wash the beaker and filter with small portions of cold water, receiving the washings in the same flask. Add sufficient water to the flask to make exactly 200 cc., and mix well. Filter, if necessary, through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer an accurately measured volume of the filtrate, equivalent to about 300 mg. of pentobarbital sodium, to a separator, saturate the solution with sodium chloride, and proceed as directed under the *Assay* for *Pentobarbital Sodium*, page 386, beginning with the words "Add to the solution 2 cc. of hydrochloric acid." The weight of the pentobarbital so obtained, multiplied by 1.097, represents the weight of $C_{11}H_{17}N_2O_3Na$ in the portion of the Capsules taken for the assay.

Packaging and storage—Preserve Pentobarbital Sodium Capsules in well-closed containers.

Sizes—Pentobarbital Sodium Capsules usually available contain the following amounts of pentobarbital sodium: 30 and 100 mg. (½ and 1½ grains).

AVERAGE DOSE OF PENTOBARBITAL SODIUM—**0.1 Gm.** (approximately 1½ grains).

Pentobarbital Sodium Tablets

PENTOBARBITAL SODIUM TABLETS

Tabellæ Pentobarbitali Sodici

Tab. Pentobarb. Sod.—Soluble Pentobarbital Tablets

Pentobarbital Sodium Tablets contain not less than 90 per cent and not more than 105 per cent of the labeled amount of $C_{11}H_{17}N_2O_3Na$.

Identification—

A: Digest a quantity of finely powdered Pentobarbital Sodium Tablets, equivalent to about 1 Gm. of pentobarbital sodium, with 20 cc. of water, and filter if necessary. A 10-cc. portion of the filtrate responds to *Identification test B* under *Pentobarbital Sodium*, page 386.

B: To the remaining portion of the filtrate from *test A* add a slight excess of diluted hydrochloric acid: a white precipitate of pentobarbital is formed. Collect the precipitate on a filter, wash it with cold water until the washings are free from chloride, and dry at about 80°: the melting range of the pentobarbital so obtained is between 125° and 130°, page 667.

C: The filtrate from *test B* responds to the flame test for *Sodium*, page 663.

Assay—Weigh a counted number of not less than 20 Pentobarbital Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 300 mg. of pentobarbital sodium, transfer it completely to a separator, and dissolve it as far as possible in 10 cc. of an alkaline sodium chloride solution, made by saturating a solution of sodium hydroxide

(1 in 50) with sodium chloride and filtering. Extract the solution with two 10-cc. portions of ether, and discard the ether. Add 2 cc. of hydrochloric acid and 5 cc. of water, shake well, and completely extract the pentobarbital with chloroform. Test for completeness of extraction by extracting with an additional 10 cc. of chloroform: when the chloroform is evaporated, not more than 0.5 mg. of residue remains. Wash the combined extracts with two 5-cc. portions of water acidified with a drop of hydrochloric acid, and extract the combined water washings with two 5-cc. portions of chloroform. Filter the combined extracts through a pledget of cotton or other suitable filter into a tared beaker, and wash the separator and the filter with several small portions of chloroform. Cautiously evaporate the combined filtrate and washings on a steam bath with the aid of a current of air, and heat the residue of pentobarbital at 100° for 2 hours, cool, and weigh. The weight of the pentobarbital so obtained, multiplied by 1.097, represents the weight of $C_{11}H_{17}N_2O_3Na$ in the portion of the Tablets taken for the assay.

Packaging and storage—Preserve Pentobarbital Sodium Tablets in tight containers.

Sizes—Pentobarbital Sodium Tablets usually available contain the following amounts of pentobarbital sodium: 30, 50, and 100 mg. (½, ¾, and 1½ grains).

AVERAGE DOSE OF PENTOBARBITAL SODIUM—**0.1 Gm.** (approximately 1½ grains).

Peppermint

PEPPERMINT

Mentha Piperita

Menth. Pip.

Peppermint consists of the dried leaf and flowering top of *Mentha piperita* Linné (Fam. *Labiatæ*).

Description—

Unground Peppermint—Leaves opposite, more or less crumpled and frequently detached from the stem; petiole from 4 to 15 mm. in length, slightly pubescent; blade ovate-oblong to oblong-lanceolate, from 1 to 9 cm. in length, apex acute, base narrowed or rounded, margin sharply serrate; light green to purplish brown; upper surface nearly glabrous, lower surface with a few hairs on the veins and many amber-colored glandular hairs; stem quadrangular, from 1 to 3 mm. in diameter, glabrous except for a few scattered deflexed hairs, green to dark purple; verticillasters usually in a compact, oblong or oval spike, from 1 to 1.5 cm. in breadth, rounded at the summit, and in fruit attaining a length of from 3 to 7 cm.; bracts oblong-lanceolate, from 4 to 7 mm. in length; calyx tubular-campanulate, equally 5-toothed, pubescent, and glandular-punctate, green to dark purple; corolla glabrous, light purple, tubular-campanulate, 4-cleft, about 3 mm. in length; stamens 4, short and equal; style 2- or rarely 3-cleft at the summit; nutlets ellipsoidal, about 500 microns in diameter; odor aromatic, characteristic; taste pungent, followed by a cooling sensation in the mouth.

Powdered Peppermint—Green to light olive green, fragments of leaf epidermis with wavy vertical walls and, if from the lower surface of the leaf, with numerous stomata and glandular and non-glandular hairs, the latter especially numerous along the veins; glandular hairs with a 1- to 2-celled stalk and 1- to 8-celled head, usually set in a depression in the leaf and containing volatile oil and frequently yellowish or brownish crystals which are birefringent; non-glandular hairs with thin, papillose walls and frequently with short, longitudinal striations, 1 to 8 cells long, the terminal cell pointed or sometimes globular; fragments of

chlorenchyma with vascular tissue, the tracheæ spiral or with simple pores and but slightly lignified; fragments of collenchyma and of thin-walled, non-lignified fibers associated with parenchyma; pollen grains spheroidal and smooth.

Stems or other foreign organic matter—The amount of *peppermint stems*, over 3 mm. in diameter, or other *Foreign organic matter* in Peppermint does not exceed 2 per cent, pages 710 and 711.

Peppermint Oil

PEPPERMINT OIL

Oleum Menthæ Piperitæ

Ol. Menth. Pip.

Peppermint Oil is the volatile oil distilled with steam from the fresh over-ground parts of the flowering plant of *Mentha piperita* Linné (Fam. *Labiatæ*), rectified by distillation and neither partially nor wholly dementholized. It yields not less than 5 per cent of esters, calculated as menthyl acetate ($C_{10}H_{19}.C_2H_3O_2$), and not less than 50 per cent of total menthol ($C_{10}H_{19}.OH$), free and as esters.

Description—Peppermint Oil is a colorless or pale yellow liquid, having a strong, penetrating odor of peppermint, and a pungent taste, followed by a sensation of cold when air is drawn into the mouth.

Specific gravity—The specific gravity of Peppermint Oil is not less than 0.896 and not more than 0.908.

Optical rotation—The optical rotation of Peppermint Oil is not less than $-18°$ and not more than $-32°$ in a 100-mm. tube at 25°, page 675.

Refractive index—The refractive index of Peppermint Oil is not less than 1.4590 and not more than 1.4650 at 20°, page 682.

Reaction—A solution of recently rectified Peppermint Oil in 70 per cent alcohol (1 in 3) is neutral to moistened litmus paper.

Dementholized or impure peppermint oil—Peppermint Oil is clearly soluble in 3 volumes of 70 per cent alcohol, by volume, showing no separation of oil globules.

Dimethyl sulfide—Distil 1 cc. from 25 cc. of Peppermint Oil, and carefully superimpose the distillate on 5 cc. of mercury bichloride T.S. in a test tube: a white film does not form at the zone of contact within 1 minute.

Distinction from Mentha arvensis oil—Prepare a 2 per cent solution of freshly redistilled aniline in glacial acetic acid. Add 5 cc. of this solution to 0.1 cc. of Peppermint Oil in a test tube. Shake well and allow the contents to stand for 5 minutes. If oil from *Mentha arvensis* is present, the mixture will turn pink, but if no oil from *Mentha arvensis* is present, the color will remain pale yellow.

Assay for esters—Place 10 cc. of Peppermint Oil in a tared,125-cc. Erlenmeyer flask, and weigh it accurately. Add 25 cc. of half-normal alcoholic potassium hydroxide, connect the flask with a reflux condenser, and boil the mixture on a water bath for exactly 1 hour. Allow the mixture to cool, and titrate the excess of alkali with half-normal sulfuric acid, using 10 drops of phenolphthalein T.S. as the indicator. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. The number of cc. of half-normal alcoholic potassium hydroxide consumed in the saponification, multiplied by 0.09915, represents the number of Gm. of esters, calculated as menthyl acetate, in the Oil taken for the assay.

Assay for total menthol—Place 10 cc. of Peppermint Oil in an acetylization flask of 100-cc. capacity, and add 10 cc. of acetic anhydride and 1 Gm. of anhydrous sodium

acetate. Boil the mixture gently for exactly 1 hour, cool, disconnect the flask from the condenser, transfer the mixture to a small separator, rinsing the acetylization flask with three successive, 5-cc. portions of warm water, and add the rinsings to the separator. When the liquids have completely separated, reject the water layer, and wash the remaining oil with successive portions of sodium carbonate T.S., diluted with an equal volume of water, until the last washing is alkaline to 2 drops of phenolphthalein T.S. Dry the resulting oil with anhydrous sodium sulfate and filter. Transfer 5 cc. of the dry acetylized oil to a tared, 100-cc. Erlenmeyer flask, note its exact weight, add 50 cc. of half-normal alcoholic potassium hydroxide, connect the flask with a reflux condenser, and boil the mixture on a water bath for exactly 1 hour. Allow the mixture to cool, and titrate the excess of alkali with half-normal sulfuric acid, using 10 drops of phenolphthalein T.S. as the indicator. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. Calculate the per cent of menthol by the following formula:

$$\text{Per cent of total menthol in the Oil tested} = \frac{A \times 7.813}{B - (A \times 0.021)} \times [1 - (E \times 0.0021)].$$

A is the result obtained by subtracting the number of cc. of half-normal sulfuric acid required in the above titration from the number of cc. of half-normal alcoholic potassium hydroxide originally taken, B is the weight of acetylized oil taken, and E is the percentage of esters calculated as menthyl acetate ($C_{10}H_{19}.C_2H_3O_2$).

Packaging and storage—Preserve Peppermint Oil in tight containers.

PEPPERMINT SPIRIT

Spiritus Menthæ Piperitæ

Sp. Menth. Pip.—Essence of Peppermint

Peppermint Spirit contains, in each 100 cc., not less than 9 cc. and not more than 11 cc. of peppermint oil.

PEPPERMINT OIL	100 cc.
PEPPERMINT, *in coarse powder*	10 Gm.
ALCOHOL, a sufficient quantity,	
To make	1000 cc.

Macerate the peppermint leaves, freed as much as possible from stems and coarsely powdered, during 1 hour in 500 cc. of distilled water, and then strongly express them. Add the moist, macerated leaves to 900 cc. of alcohol, and allow the mixture to stand 6 hours with frequent agitation. Filter, and to the filtrate add the oil and sufficient alcohol to make the product measure 1000 cc.

Assay—Transfer exactly 5 cc. of Peppermint Spirit to a Babcock bottle, graduated to 8 per cent, add exactly 1 cc. of kerosene from a pipette calibrated to deliver that amount, and mix well. Then add sufficient saturated calcium chloride solution

acidified with hydrochloric acid, almost to fill the bulb of the bottle. Rotate the bottle vigorously to insure thorough mixing, then add sufficient of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and then read the volume of oil in the stem. Subtract 5 divisions for the kerosene added, and multiply the remaining number of divisions by 4.2 to obtain the volume of peppermint oil in 100 cc. of the Spirit.

Alcohol content—From 79 to 85 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Peppermint Spirit in tight containers, protected from light.

AVERAGE DOSE—1 cc. (approximately 15 minims).

Peppermint Water

PEPPERMINT WATER

Aqua Menthæ Piperitæ

Aq. Menth. Pip.

Peppermint Water is a clear, saturated solution of peppermint oil in distilled water, prepared by one of the processes described under *Waters*, page 726.

Persic Oil

PERSIC OIL

Oleum Persicæ

Ol. Persic.—Apricot Kernel Oil, Peach Kernel Oil

Persic Oil is the oil expressed from the kernels of varieties of *Prunus Armeniaca* Linné (Apricot Kernel Oil), or from the kernels of varieties of *Prunus Persica* Sieb. et Zucc. (Peach Kernel Oil) (Fam. *Rosaceæ*).

Description—Persic Oil is a clear, pale straw-colored or colorless, oily liquid. It is almost odorless, and has a bland taste.

Solubility—Persic Oil is slightly soluble in alcohol, but is miscible with ether, chloroform, benzene, and petroleum benzin.

Specific gravity—The specific gravity of Persic Oil is not less than 0.910 and not more than 0.918.

Mineral oil—Heat on a water bath 10 cc. of Persic Oil with 15 cc. of a solution of sodium hydroxide (1 in 6) and 30 cc. of alcohol in a flask having a small, short-stemmed funnel inserted in the neck, and occasionally agitate the mixture until it becomes clear. Transfer the solution to a shallow dish, evaporate the alcohol on a water bath, and mix the residue with 100 cc. of water: a clear solution results.

Other oils—Persic Oil meets the requirements of the tests for *Cottonseed oil* and for *Sesame oil* under *Olive Oil*, page 357. It is not turbid at temperatures above 15°.

Iodine value—The iodine value of Persic Oil is not less than 90 and not more than 108, page 647.
Saponification value—The saponification value of Persic Oil is not less than 185 and not more than 195, page 647.
Packaging and storage—Preserve Persic Oil in tight containers.
Labeling—Label Persic Oil to indicate whether it was derived from apricot kernels or from peach kernels.

PERUVIAN BALSAM

Balsamum Peruvianum

Balsam. Peruv.—Peru Balsam

Peruvian Balsam is obtained from *Myroxylon Pereiræ* (Royle) Klotzsch (Fam. *Leguminosæ*).

Description—Peruvian Balsam is a dark brown, viscid liquid. It is transparent and appears reddish brown in thin layers. It has an agreeable odor resembling vanilla, a bitter, acrid taste, with a persistent after-taste, and is free from stringiness or stickiness. It does not harden on exposure to air. Water becomes acid to litmus paper when agitated with Peruvian Balsam.
Solubility—Peruvian Balsam is nearly insoluble in water, but is soluble in alcohol, in chloroform, and in glacial acetic acid, with not more than an opalescence. It is only partly soluble in ether and in petroleum benzin.
Specific gravity—The specific gravity of Peruvian Balsam is not less than 1.150 and not more than 1.170.
Fixed oils—One Gm. of Peruvian Balsam forms a clear solution when shaken with a solution of 3 Gm. of chloral hydrate in 2 cc. of water.
Rosin—Peruvian Balsam meets the requirements of the test for *rosin*, page 688.
Turpentine—Shake about 1 Gm. of Peruvian Balsam with 5 cc. of petroleum benzin, and warm the mixture on a water bath for 10 minutes, adding a sufficient quantity of the solvent to replace that lost by evaporation. On evaporating 2 cc. of the filtered benzin solution, no odor of oil of turpentine is noticeable.
Acid value—Dissolve about 1 Gm. of Peruvian Balsam, accurately weighed, in 100 cc. of neutralized alcohol, add 1 cc. of phenolphthalein T.S., and titrate the solution with half-normal sodium hydroxide: the acid value is not less than 56 and not more than 84, page 646.
Cinnamein, saponification value—Mix about 3 Gm. of Peruvian Balsam, accurately weighed, with 30 cc. of sodium hydroxide T.S. in a separator, shake the mixture for a few minutes with 60 cc. of ether, and allow it to stand until complete separation into two layers has taken place. Draw off the lower water layer and quickly filter the ether layer into a flask. Transfer 50 cc. of the ether filtrate (representing five-sixths of the weight of the Balsam taken) to a tared Erlenmeyer flask, evaporate the ether, and dry the residue at 100° for 30 minutes: the weight of the residue of cinnamein so obtained is equivalent to not less than 50 per cent and not more than 60 per cent of the weight of the Balsam represented by the 50 cc. of ether solution taken. Dissolve this residue in 25 cc. of alcohol, add 25 cc. of half-normal alcoholic potassium hydroxide, and heat the mixture carefully on a water bath for 30 minutes in a flask provided with a reflux condenser. Then add 1 cc. of phenolphthalein T.S., and titrate the excess of alkali with half-normal hydrochloric acid. Determine the normality of the alcoholic potassium hydroxide in the same manner

as in the test. The total volume of half-normal alcoholic potassium hydroxid consumed is equivalent to a saponification value for the cinnamein of not less than 230 and not more than 240, page 647.

Packaging and storage—Preserve Peruvian Balsam in tight containers and avoid exposure to excessive heat.

Petrolatum

PETROLATUM

Petrolatum

Petrolat.—Petroleum Jelly

Petrolatum is a purified, semi-solid mixture of hydrocarbons obtained from petroleum.

Description—Petrolatum is an unctuous mass, varying in color from yellowish to light amber. It has not more than a slight fluorescence even after being melted, and is transparent in thin layers. It is free or nearly free from odor and taste.

Solubility—Petrolatum is insoluble in water. It is almost insoluble in cold or hot alcohol, and in cold dehydrated alcohol. It is freely soluble in benzene, in carbon disulfide, in chloroform, and in turpentine oil. It is soluble in ether, in petroleum benzin, and in most fixed and volatile oils, the degree of solubility in these solvents varying with the composition of the Petrolatum.

Specific gravity—The specific gravity of Petrolatum is not less than 0.815 and not more than 0.880 at 60°.

Melting range—Petrolatum melts between 38° and 60°, page 667, Class III.

Residue on ignition—Heat 2 Gm. of Petrolatum in an open porcelain or platinum dish over a Bunsen flame: it volatilizes without emitting an acrid odor, and on ignition leaves not more than 0.05 per cent of residue, page 685.

Organic acids—Weigh 20 Gm. of Petrolatum, add 100 cc. of a mixture of neutralized alcohol and water (1 in 2), agitate thoroughly, and heat to boiling. Add 1 cc. of phenolphthalein T.S., and titrate rapidly with tenth-normal sodium hydroxide, with vigorous agitation, to a sharp pink end-point, noting the color change in the alcohol-water layer: not more than 0.4 cc. of tenth-normal sodium hydroxide is required.

Free alkali—Introduce 35 Gm. of Petrolatum into a 250-cc. separatory funnel, add 100 cc. of boiling water, and shake vigorously for 5 minutes. After the Petrolatum and water have separated, draw off the water into a casserole, and wash the Petrolatum in the separatory funnel with two 50-cc. portions of boiling water, and add the washings to the casserole. To the accumulated 200 cc. of water add 1 drop of phenolphthalein T.S., and boil: the solution does not acquire a pink color.

Acid—If the addition of phenolphthalein in the test for *free alkali* produces no pink color, add 0.1 cc. of methyl orange T.S.: no red or pink color is produced.

Fixed oils, fats, or rosin—Digest 10 Gm. of Petrolatum at 100° with 10 Gm. of sodium hydroxide and 50 cc. of water for 30 minutes. Separate the water layer, and add to it an excess of diluted sulfuric acid: no oily or solid matter separates.

Consistency—The consistency of Petrolatum is not less than 100 and not more than 275, page 629.

Color—Melt about 10 Gm. of Petrolatum on a water bath, and pour about 5 cc. of the liquid into a clear glass bacteriological test tube, 150 × 15 mm., keeping the Petrolatum melted. The Petrolatum is not darker than a solution made by mixing 3.8 cc. of ferric chloride C.S. and 1.2 cc. of cobaltous chloride C.S. in a similar tube, and comparing the two in reflected light against a white background, the Petrolatum tube being held at such an angle that there is no fluorescence.

Packaging and storage—Preserve Petrolatum in well-closed containers.

HYDROPHILIC PETROLATUM
Petrolatum Hydrophilicum
Petrolat. Hydrophil.

Cholesterol	10 Gm.
Stearyl Alcohol	30 Gm.
White Wax	80 Gm.
Wool Fat	150 Gm.
White Petrolatum	730 Gm.
To make	1000 Gm.

Melt the stearyl alcohol, white wax, wool fat and white petrolatum together on a water bath, then add the cholesterol, and stir until it completely dissolves. Remove from the water bath, and stir until the mixture congeals.

LIQUID PETROLATUM
Petrolatum Liquidum
Petrolat. Liq.—Liquid Paraffin, White Mineral Oil, Heavy Liquid Petrolatum

Liquid Petrolatum is a mixture of liquid hydrocarbons obtained from petroleum.

Description—Liquid Petrolatum is a colorless, transparent, oily liquid, free, or nearly free, from fluorescence. It is odorless and tasteless when cold, and develops not more than a faint odor of petroleum when heated.

Solubility—Liquid Petrolatum is insoluble in water and in alcohol. It is miscible with most fixed oils but not with castor oil. It is soluble in volatile oils.

Specific gravity—The specific gravity of Liquid Petrolatum is not less than 0.860 and not more than 0.905.

Viscosity—Liquid Petrolatum has a kinematic viscosity of not less than 38.1 centistokes at 37.8°, page 716.

Reaction—Boil 10 cc. of Liquid Petrolatum with an equal volume of reagent alcohol: the alcohol remains neutral to moistened litmus paper.

Readily carbonizable substances—Place 5 cc. of Liquid Petrolatum in a glass-stoppered test tube which has been previously rinsed with chromic acid cleansing mixture, page 628, then rinsed with water, and dried. Add 5 cc. of sulfuric acid containing from 94.5 per cent to 94.9 per cent of H_2SO_4, and heat in a boiling water bath for 10 minutes. After the test tube has been in the bath for 30 seconds, remove it quickly, hold with the finger over the stopper, and give three vigorous, vertical shakes over an amplitude of about 5 inches. Repeat every 30 seconds. Do not keep the test tube out of the bath longer than 3 seconds for each shaking period. At the end of 10 minutes from the time when first placed in the water bath, remove the test tube: the Liquid Petrolatum remains unchanged in color

and the acid does not become darker than the standard color produced by mixing in a similar test tube 3 cc. of ferric chloride C.S., 1.5 cc. of cobaltous chloride C.S., and 0.5 cc. of cupric sulfate C.S., this mixture being overlaid with 5 cc. of Liquid Petrolatum.

Solid paraffin—Fill a tall, cylindrical, standard oil-sample bottle of colorless glass of about 120-cc. capacity with Liquid Petrolatum, which has been dried previously in a beaker at 100° for 2 hours and cooled to room temperature in a desiccator over sulfuric acid. Stopper, and immerse the bottle in a mixture of ice and water for 4 hours: the Liquid Petrolatum is sufficiently clear that a black line 0.5 mm. in width, held vertically behind the sample bottle, is easily seen.

Sulfur compounds—Prepare a saturated solution of lead monoxide in a solution of sodium hydroxide (1 in 5), and mix 2 drops of the clear solution with 4 cc. of Liquid Petrolatum and 2 cc. of dehydrated alcohol: the mixture does not darken after heating at 70° for 10 minutes and cooling.

Packaging and storage—Preserve Liquid Petrolatum in tight containers.

AVERAGE DOSE—**15 cc.** (approximately 4 fluidrachms).

Petrolatum, Liquid, Emulsion

LIQUID PETROLATUM EMULSION

Emulsum Petrolati Liquidi

Emuls. Petrolat. Liq.—Mineral Oil Emulsion

LIQUID PETROLATUM	500 cc.
ACACIA, in very fine powder	125 Gm.
SYRUP	100 cc.
VANILLIN	40 mg.
ALCOHOL	60 cc.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Mix the liquid petrolatum with the powdered acacia in a dry mortar, add 250 cc. of distilled water all at once, and emulsify the mixture. Then add, in divided portions and triturating after each addition, a mixture of the syrup, 50 cc. of distilled water and the vanillin dissolved in the alcohol. Finally add sufficient distilled water to make the product measure 1000 cc., and mix well.

The vanillin may be replaced by not more than 1 per cent of any other flavoring substance or any mixture of flavoring substances recognized in this Pharmacopœia. Sixty cc. of sweet orange peel tincture, or 2 Gm. of benzoic acid may be used as a preservative in place of the alcohol.

For permissible modifications, see *Emulsions*, page 643.

Alcohol content (when present)—From 5 to 7 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Liquid Petrolatum Emulsion in tight containers.

AVERAGE DOSE—**30 cc.** (approximately 1 fluidounce).

Petrolatum, Liquid, Light

LIGHT LIQUID PETROLATUM

Petrolatum Liquidum Leve

Petrolat. Liq. Lev.—Light Liquid Paraffin, Light White Mineral Oil

Light Liquid Petrolatum is a mixture of liquid hydrocarbons obtained from petroleum.

Viscosity—Light Liquid Petrolatum has a kinematic viscosity of not more than 37 centistokes at 37.8°, page 716.

Specific gravity and other tests—With the exception of the specific gravity, which is not less than 0.828 and not more than 0.880, Light Liquid Petrolatum conforms to the *Description* and *Solubility*, and meets the requirements of the *other tests* under *Liquid Petrolatum*, page 395.

Packaging and storage—Preserve Light Liquid Petrolatum in tight containers.

Petrolatum, White

WHITE PETROLATUM

Petrolatum Album

Petrolat. Alb.—White Petroleum Jelly

White Petrolatum is petrolatum wholly or nearly decolorized.

Description—White Petrolatum is a white or faintly yellowish, unctuous mass, transparent in thin layers even after cooling to 0°.

Color—Melt about 10 Gm. of White Petrolatum on a water bath, and pour 5 cc. of the liquid into a clear glass bacteriological test tube, 150 × 15 mm., keeping the White Petrolatum melted. The White Petrolatum is not darker than a solution made by mixing 0.5 cc. of cupric sulfate C.S., 0.7 cc. of ferric chloride C.S., and 3.8 cc. of water in a similar tube, and comparing the two in reflected light against a white background, holding the White Petrolatum tube at such an angle that there is no fluorescence.

Other tests—In other respects White Petrolatum has the characteristics and meets the requirements of the tests described under *Petrolatum*, page 394.

Packaging and storage—Preserve White Petrolatum in well-closed containers.

Petroleum Benzin

PETROLEUM BENZIN

Benzinum Petrolei

Benzin. Petrol.—Petroleum Ether, Purified Benzin U. S. P. XII

Petroleum Benzin is a purified distillate from petroleum, consisting of hydrocarbons, chiefly of the methane series.

Caution—Petroleum Benzin is highly inflammable, and its vapor, when mixed with air and ignited, may explode.

Description—Petroleum Benzin is a clear, colorless, nonfluorescent, volatile liquid, having an ethereal or faint, petroleum-like odor, and a neutral reaction.

Solubility—Petroleum Benzin is practically insoluble in water. It is freely soluble in dehydrated alcohol, and is miscible with ether, chloroform, benzene, and with fixed and volatile oils, with the exception of castor oil.

Specific gravity—The specific gravity of Petroleum Benzin varies from 0.634 to 0.660.

Distillation range—Petroleum Benzin distils completely between 35° and 80° when tested by *Method II*, under *Boiling and Distilling Points*, page 624.

Residue on evaporation—Not more than 1 mg. of residue remains on evaporating 50 cc. of Petroleum Benzin in a glass or porcelain dish at a temperature not exceeding 40°.

Oils, fats, and sulfur compounds—Pour 10 cc. of Petroleum Benzin in portions upon clean, odorless filter paper laid on a warm glass plate: no disagreeable or notably sulfuretted odor becomes apparent as the last portions of liquid disappear from the paper, and no greasy stain remains.

Sulfur compounds or silver-reducing substances—Boil 10 cc. of Petroleum Benzin for a few minutes with one-fourth its volume of alcoholic ammonia T.S. and a few drops of silver nitrate T.S.: the liquid does not turn brown.

Benzene—Add 5 drops of Petroleum Benzin to a mixture of 40 drops of sulfuric acid and 10 drops of nitric acid in a test tube, warm the liquid for about 10 minutes, set it aside for 30 minutes, and then dilute it with water in a shallow dish: no odor of nitrobenzene is evolved.

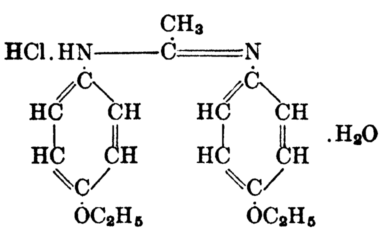
Packaging and storage—Preserve Petroleum Benzin in tight containers, remote from fire, at a temperature not above 30°.

Phenacaine Hydrochloride

PHENACAINE HYDROCHLORIDE

Phenacainæ Hydrochloridum

Phenacain. Hydrochlor.



$C_{18}H_{22}N_2O_2.HCl.H_2O$ Mol. wt. 352.85

Phenacaine Hydrochloride, when dried at 105° for 6 hours, contains not less than 87.5 per cent and not more than 90.5 per cent of phenacaine base ($C_{18}H_{22}N_2O_2$), corresponding to not less than 98 per cent of $C_{18}H_{22}N_2O_2.HCl$.

Description—Phenacaine Hydrochloride occurs as small, white crystals. It is odorless, has a faintly bitter taste, producing transient numbness of the tongue, and is permanent in air.

Solubility—One Gm. of Phenacaine Hydrochloride dissolves in 50 cc. of water. It is freely soluble in alcohol and in chloroform, and is insoluble in ether.

Melting temperature—When dried to constant weight at 105°, Phenacaine Hydrochloride melts at a temperature not below 190°, page 667.

Identification—

A: To 5 cc. of a saturated solution of Phenacaine Hydrochloride add a few drops of sodium hypochlorite T.S.: a flesh colored precipitate is formed which changes in a few minutes to a violet color. When the mixture is shaken with ether, the ether becomes deep red.

B: A solution of Phenacaine Hydrochloride (1 in 100) responds to the test for *Chloride*, page 659.

C: The base obtained in the *Assay*, when recrystallized from hot alcohol and dried at 105° for 1 hour, melts between 116° and 118°, page 667.

Free acid—Dissolve 1 Gm. of Phenacaine Hydrochloride in 50 cc. of warm water, cool, and add 1 drop of methyl red T.S. If a red color is produced, it requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide to change it to yellow.

Loss on drying—When dried at 105° for 6 hours, Phenacaine Hydrochloride loses not more than 7 per cent of its weight.

Residue on ignition—Phenacaine Hydrochloride yields not more than 0.15 per cent of residue on ignition, page 685.

Acetophenetidin—Dissolve 50 mg. of Phenacaine Hydrochloride in 2 cc. of hydrochloric acid, boil for 2 minutes, cool, and add 1 drop of potassium dichromate T.S.: no ruby red color is produced.

Assay—To about 25 cc. of water and 5 cc. of ammonia T.S. contained in a separator, add about 500 mg. of Phenacaine Hydrochloride, previously dried at 105° for 6 hours and accurately weighed. Extract this solution with four successive portions of 15, 10, 10, and 10 cc. of chloroform. Pass the chloroform extracts through a pledget of purified cotton in a small funnel into a tared beaker, and wash the cotton and funnel with a few cc. of chloroform. Cautiously evaporate the chloroform, adding 5 cc. of alcohol just before the last of the chloroform is expelled. Evaporate the alcohol, dry the residue to constant weight at 105°, and weigh.

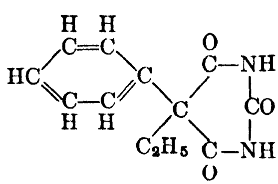
Packaging and storage—Preserve Phenacaine Hydrochloride in well-closed containers.

Phenobarbital

PHENOBARBITAL

Phenobarbitalum

Phenobarb.—Phenylethylmalonylurea, Phenobarbitone



$C_{12}H_{12}N_2O_3$ Mol. wt. 232.23

Description—Phenobarbital occurs as white, odorless, glistening, small crystals, or as a white, crystalline powder. It is stable in air. A saturated solution is acid to litmus paper.

Solubility—One Gm. of Phenobarbital dissolves in about 1000 cc. of water, in 10 cc. of alcohol, in about 40 cc. of chloroform, and in 15 cc. of ether. It is soluble in solutions of fixed alkali hydroxides or carbonates.

Melting range—Phenobarbital melts between 174° and 178°, page 667.

Identification—

A: Boil about 200 mg. of Phenobarbital with 10 cc. of sodium hydroxide T.S.: ammonia is evolved.

B: Shake about 300 mg. of Phenobarbital for 2 minutes with 1 cc. of normal sodium hydroxide and 5 cc. of water, filter, and divide the filtrate into two portions. To one portion add mercuric nitrate T.S.: a white precipitate is produced, which is soluble in ammonia T.S. To the other portion add silver nitrate T.S. a few drops at a time: a white precipitate is produced, which at first redissolves but becomes insoluble when an excess of silver nitrate has been added.

Distinction from barbital—In a large, dry test tube mix 200 mg. of Phenobarbital, 500 mg. of potassium nitrate, and 2 cc. of sulfuric acid, and immerse the test tube in a bath of boiling water for 20 minutes. Cool the mixture, cautiously add 3 cc. of water and follow with ammonia T.S. until the mixture is distinctly alkaline. Boil the mixture until the evolution of nitrogen ceases, cool, and add, without mixing, 2 drops of colorless ammonium sulfide T.S.: a brown red ring is formed, which gradually diffuses to give an orange red precipitate. No colored ring or precipitate is formed by barbital.

Loss on drying—When dried over sulfuric acid for 4 hours, Phenobarbital loses not more than 1 per cent of its weight.

Residue on ignition—Phenobarbital yields not more than 0.15 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 500 mg. of Phenobarbital in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Phenylbarbituric acid—Boil 2 Gm. of Phenobarbital with 10 cc. of alcohol under a reflux condenser for 3 minutes: a clear and complete solution results.

Packaging and storage—Preserve Phenobarbital in well-closed containers.

AVERAGE DOSE—**30 mg.** (approximately ½ grain).

Phenobarbital Elixir

PHENOBARBITAL ELIXIR

Elixir Phenobarbitali

Elix. Phenobarb.

Phenobarbital Elixir contains, in each 100 cc., not less than 0.37 Gm. and not more than 0.43 Gm. of $C_{12}H_{12}N_2O_3$.

PHENOBARBITAL	4 Gm.
SWEET ORANGE PEEL TINCTURE	30 cc.
AMARANTH SOLUTION	10 cc.
ALCOHOL	125 cc.
GLYCERIN	450 cc.
SYRUP	150 cc.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Dissolve the phenobarbital in the alcohol, add the sweet orange peel tincture, the glycerin, the syrup, the amaranth solution, and sufficient distilled water to make the product measure 1000 cc. Mix well and filter, if necessary, to produce a clear Elixir.

Identification—The phenobarbital obtained in the assay, when recrystallized from hot alcohol and dried at 100°, melts between 174° and 178°, page 667.
Assay—Transfer exactly 25 cc. of Phenobarbital Elixir to a separator, acidify with diluted hydrochloric acid, and saturate with sodium chloride. Add 30 cc. of chloroform, and shake the mixture gently for about 30 seconds. When the liquids have separated, draw off the chloroform layer into a second separator, and completely extract the phenobarbital with successive 25-cc. portions of chloroform, combining the chloroform extracts in the second separator. Shake the combined chloroform extracts with 10 cc. of water, and draw off the chloroform through a pledget of purified cotton into a tared beaker. Wash the water layer with 10 cc. of chloroform, and draw this off through the cotton filter into the tared beaker. Evaporate the chloroform on a steam bath with the aid of a current of air, dry the residue at 100° for 2 hours, cool, and weigh. The weight of the residue is the weight of $C_{12}H_{12}N_2O_3$ in the portion of Elixir taken for assay.
Alcohol content—From 12 to 15 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Phenobarbital Elixir in tight, light-resistant containers.

AVERAGE DOSE—4 cc. (approximately 1 fluidrachm).

Phenobarbital Tablets

PHENOBARBITAL TABLETS

Tabellæ Phenobarbitali

Tab. Phenobarb.

Phenobarbital Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $C_{12}H_{12}N_2O_3$.

Identification—Triturate a quantity of the finely powdered Phenobarbital Tablets, equivalent to about 500 mg. of phenobarbital, with 10 cc. of petroleum benzin, then decant the liquid as completely as possible. Again treat the residue in the same manner with 5 cc. of petroleum benzin, and evaporate any benzin remaining in the residue on a steam bath. Dissolve the residue by warming with 10 cc. of sodium carbonate T.S., and filter. Add hydrochloric acid, dropwise, to the filtrate until no more precipitate is produced. Collect the precipitate on a filter, wash it well with small portions of cold water until the washings are free from chloride, and dry at about 100°. The resulting phenobarbital melts between 174° and 178°, page 667, and responds to the *Identification tests* under *Phenobarbital*.
Assay—*When stearic acid or stearates are absent:* Weigh a counted number of not less than 20 Phenobarbital Tablets and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder equivalent to about 300 mg. of phenobarbital, transfer it completely to a separator, and dissolve in 10 cc. of an alkaline salt solution, prepared by saturating a solution of sodium hydroxide (1 in 50) with sodium chloride and filtering. If lubricants other than stearic acid are present, extract the solution with three 10-cc. portions of ether, and discard the ether extracts. Add to the alkaline solution 5 cc. of water and 2 cc. of hydrochloric acid, shake well, and completely extract the liberated phenobarbital with 25-cc. portions of chloroform. Test for completeness of extraction by extracting with an additional 10-cc. portion of chloroform and evaporating the solvent: not more than 0.5 mg. of residue remains. Wash the combined chloroform extracts with two 5-cc. portions of water, and extract the combined water washings with two 5-cc. portions of chloroform. Filter the chloroform extracts through a small filter into a tared beaker, wash the separator and the filter with small por-

tions of chloroform. Evaporate the chloroform on a steam bath with the aid of a current of air, and dry the residue at 100° for 2 hours, cool, and weigh.

When stearic acid or stearates are present: Dissolve the weighed residue obtained as described in the preceding paragraph in 10 cc. of alcohol, add 20 cc. of saturated barium hydroxide solution, and stir well. Filter into a separator and wash the residue and filter with three 10-cc. portions of the barium hydroxide solution. Then acidify the solution with diluted hydrochloric acid, and proceed as directed in the preceding paragraph, beginning with "completely extract the liberated phenobarbital."

In either case the weight of the residue represents the weight of phenobarbital in the portion of the Tablets taken for the assay.

Packaging and storage—Preserve Phenobarbital Tablets in well-closed containers.

Sizes—Phenobarbital Tablets usually available contain the following amounts of phenobarbital: 15, 30, and 100 mg. (¼, ½, and 1½ grains).

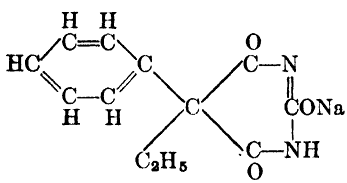
AVERAGE DOSE OF PHENOBARBITAL—**30 mg.** (approximately ½ grain).

Phenobarbital Sodium

PHENOBARBITAL SODIUM

Phenobarbitalum Sodicum

Phenobarb. Sod.—Soluble Phenobarbital, Soluble Phenobarbitone



$C_{12}H_{11}N_2O_3Na$ Mol. wt. 254.22

Phenobarbital Sodium contains not less than 89 per cent and not more than 91.5 per cent of phenobarbital ($C_{12}H_{12}N_2O_3$), calculated on a moisture-free basis, corresponding to not less than 98.5 per cent of $C_{12}H_{11}N_2O_3Na$.

Description—Phenobarbital Sodium occurs as flaky crystals, as white, crystalline granules, or as a white powder. It is odorless, has a bitter taste, and is hygroscopic. Its solutions are alkaline to litmus paper and to phenolphthalein T.S.

Solubility—Phenobarbital Sodium is very soluble in water, soluble in alcohol, but practically insoluble in ether and in chloroform.

Identification—

A: Add a slight excess of diluted hydrochloric acid to 5 cc. of a solution of Phenobarbital Sodium (1 in 10): a white precipitate of phenobarbital is produced.

B: The residue of phenobarbital, obtained in the *Assay*, melts between 174° and 178°, page 667, and responds to *Identification tests A* and *B* and the test for *Distinction from barbital* under *Phenobarbital*, page 399.

C: Ignite about 500 mg. of Phenobarbital Sodium: the residue, when moistened with water, effervesces upon the addition of diluted hydrochloric acid, and responds to the tests for *Sodium*, page 663.

Loss on drying—Dry about 1 Gm. of Phenobarbital Sodium, accurately weighed, at 140° for 6 hours: the loss in weight does not exceed 7 per cent.

Heavy metals—Dissolve 2 Gm. of Phenobarbital Sodium in 42 cc. of water. Add slowly, with vigorous stirring, 8 cc. of normal hydrochloric acid, and filter, rejecting the first 5 cc. of the filtrate: the heavy metals limit, page 657, for Phenobarbital Sodium, determined in 25 cc. of the filtrate, is 30 parts per million.

Readily carbonizable substances—Dissolve 500 mg. of Phenobarbital Sodium in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Free phenobarbital—Shake 500 mg. of Phenobarbital Sodium with 20 cc. of absolute ether, filter, evaporate the filtrate to dryness in a tared dish, and dry the residue at 100° for 1 hour: the residue weighs not more than 3 mg.

Assay—Dissolve about 500 mg. of Phenobarbital Sodium, accurately weighed, in 15 cc. of water in a separator, add to the solution 2 cc. of hydrochloric acid, shake well, and completely extract the liberated phenobarbital with 25-cc. portions of chloroform. Test for completeness of extraction by extracting with an additional 10-cc. portion of chloroform and evaporating the solvent: not more than 0.5 mg. of residue remains. Wash the combined extracts with two portions of 5 cc. each of water, and extract the combined water washings with two 5-cc. portions of chloroform. Filter the combined extracts through a pledget of cotton, or other suitable filter, into a tared beaker, and wash the separator and the filter with several small portions of chloroform. Evaporate the combined filtrate and washings on a steam bath with the aid of a current of air, dry the residue of phenobarbital at 100° for 2 hours, cool, and weigh.

Packaging and storage—Preserve Phenobarbital Sodium in tight containers.

AVERAGE DOSE—**30 mg.** (approximately ½ grain).

Phenobarbital Sodium Tablets

PHENOBARBITAL SODIUM TABLETS

Tabellæ Phenobarbitali Sodici

Tab. Phenobarb. Sod.—Soluble Phenobarbital Tablets

Phenobarbital Sodium Tablets contain not less than 90 per cent and not more than 105 per cent of the labeled amount of $C_{12}H_{11}N_2O_3Na$.

Identification—

A: Digest a quantity of finely powdered Phenobarbital Sodium Tablets, equivalent to about 1 Gm. of phenobarbital sodium, with 10 cc. of water, and filter if necessary. Add to the filtrate 2 cc. of diluted hydrochloric acid: a white precipitate of phenobarbital is produced. Collect the precipitate on a filter, wash it with cold water until the washings are free from chloride, then dry at 100°. The phenobarbital so obtained melts between 174° and 178°, page 667, and responds to *Identification tests A* and *B* under *Phenobarbital*, page 399.

B: A solution of Phenobarbital Sodium Tablets responds to the flame test for *Sodium*, page 663.

Assay—Weigh a counted number of not less than 20 Phenobarbital Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder equivalent to about 350 mg. of phenobarbital sodium and proceed as directed in the *Assay* for *Phenobarbital Tablets*, page 401, beginning with

"transfer it completely to a separator." The weight of the phenobarbital so obtained, multiplied by 1.095, represents the weight of $C_{12}H_{11}N_2O_3Na$ in the portion of the Tablets taken for the assay.

Packaging and storage—Preserve Phenobarbital Sodium Tablets in tight containers.

Sizes—Phenobarbital Sodium Tablets usually available contain the following amounts of phenobarbital sodium: 30 and 100 mg. (½ and 1½ grains).

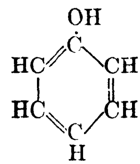
AVERAGE DOSE OF PHENOBARBITAL SODIUM—**30 mg.** (approximately ½ grain).

Phenol

PHENOL

Phenol

Carbolic Acid



C_6H_6O Mol. wt. 94.11

Phenol contains not less than 98 per cent of C_6H_6O.

Description—Phenol occurs as colorless to light pink, interlaced, or separate, needle-shaped crystals, or as a white or light pink, crystalline mass. It has a characteristic odor. When undiluted, it whitens and cauterizes the skin and mucous membranes. When gently heated, Phenol melts, forming a highly refractive liquid. It is liquefied by the addition of 10 per cent of water. Its vapor is inflammable. Phenol gradually darkens on exposure to light and air.

Solubility—One Gm. of Phenol dissolves in 15 cc. of water. It is very soluble in alcohol, in glycerin, in chloroform, in ether, and in fixed and volatile oils. It is soluble in petrolatum and in liquid petrolatum.

Congealing temperature—Phenol congeals at a temperature not lower than 39°, page 629.

Identification—

A: A solution of Phenol yields with bromine T.S. a white precipitate which at first redissolves, but becomes permanent as more of the reagent is added.

B: Add 1 drop of ferric chloride T.S. to 10 cc. of a solution of Phenol (1 in 100): the liquid acquires a violet blue color.

Non-volatile residue—Heat about 5 Gm. of Phenol, accurately weighed, in a tared porcelain dish, on a water bath until it is volatilized, and dry at 105° for 1 hour: not more than 0.05 per cent of residue remains.

Clarity of solution and reaction—A solution of Phenol (1 in 15) is clear, and neutral or only faintly acid to litmus paper.

Assay—Dissolve about 1.5 Gm. of Phenol, accurately weighed, in sufficient water to make 1000 cc. of solution. Transfer an aliquot of the solution, containing from 38 to 41 mg. of Phenol, to an iodine flask, add 30 cc. of tenth-normal bromine, then 5 cc. of hydrochloric acid, and immediately insert the stopper. Shake the flask

repeatedly during 30 minutes, allow it to stand for 15 minutes, remove the stopper just sufficiently to introduce quickly 5 cc. of a solution of potassium iodide (1 in 5), being careful that no bromine vapor escapes, and at once stopper the flask. Shake thoroughly, remove the stopper, and rinse it and the neck of the flask with a little water, so that the washings may flow into the flask. Add 1 cc. of chloroform, shake the mixture well, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Determine the normality of the tenth-normal bromine in the same manner as in the test. Each cc. of tenth-normal bromine is equivalent to 1.569 mg. of C_6H_6O.

Packaging and storage—Preserve Phenol in tight, light-resistant containers.

Phenol, Liquefied

LIQUEFIED PHENOL

Phenol Liquefactum

Phenol Liq.—Liquefied Carbolic Acid

Liquefied Phenol is phenol maintained in a liquid condition by the presence of 10 per cent of water. It contains not less than 88 per cent of C_6H_6O.

Liquefied Phenol may be prepared by the following method:

PHENOL, a convenient quantity,
DISTILLED WATER, a sufficient quantity.

Liquefy the phenol by placing the unstoppered container in a water bath and applying heat gradually. Transfer the liquid to a tared vessel, weigh, add 1 Gm. of distilled water for each 9 Gm. of Phenol, and mix thoroughly.

Note—When phenol is to be mixed with a fixed oil, liquid petrolatum, or petrolatum, melted crystalline Phenol, page 404, should be used instead of Liquefied Phenol.

Description—Liquefied Phenol is a colorless liquid, which may develop a red tint upon exposure to air or light. It has a characteristic, somewhat aromatic odor. When undiluted, it whitens and cauterizes the skin and mucous membranes. Its specific gravity is about 1.065.

Solubility—Liquefied Phenol is miscible with alcohol, with ether, and with glycerin. A mixture of Liquefied Phenol and an equal volume of glycerin is miscible with water.

Boiling temperature—When subjected to distillation, the boiling temperature of Liquefied Phenol does not rise above 182°, page 624.

Other requirements—Liquefied Phenol responds to the tests for *Identification*, for *Non-volatile residue*, and for *Clarity of solution and reaction* described under *Phenol*, page 404.

Assay—Proceed as directed under *Phenol*, page 404.

Packaging and storage—Preserve in tight, light-resistant containers.

Phenol Ointment

PHENOL OINTMENT

Unguentum Phenolis

Ung. Phenol.—Carbolic Acid Ointment

Phenol Ointment contains not less than 1.8 per cent and not more than 2.2 per cent of C_6H_6O.

Phenol	20 Gm.
Glycerin	20 Gm.
White Ointment	960 Gm.
To make	1000 Gm.

Dissolve the phenol in the glycerin and incorporate the solution into the white ointment (see page 2).

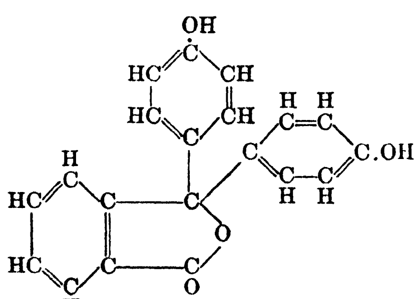
Assay—Place in a separator about 2 Gm. of Phenol Ointment, accurately weighed. Add about 25 cc. of petroleum benzin, and shake until dissolved. Add 25 cc. of water, again shake, allow to separate, and drain off the water layer into a 500-cc. iodine flask. Completely extract the phenol with four successive 25-cc. portions of water. To the combined extracts add exactly 50 cc. of tenth-normal bromine, and proceed as directed under the *Assay* for *Phenol*, page 404, beginning with the words, "then 5 cc. of hydrochloric acid."

Phenolphthalein

PHENOLPHTHALEIN

Phenolphthaleinum

Phenolphthal.



$C_{20}H_{14}O_4$ Mol. wt. 318.31

Description—Phenolphthalein occurs as a white or faintly yellowish white, crystalline powder. It is odorless, and is stable in air.

Solubility—Phenolphthalein is almost insoluble in water. One Gm. of it dissolves in 15 cc. of alcohol, and in about 100 cc. of ether.

Melting temperature—The melting temperature of Phenolphthalein is not lower than 258°, page 667.

Identification—Phenolphthalein is readily dissolved by solutions of alkali hydroxides and by hot solutions of alkali carbonates, yielding red liquids. These solutions are decolorized by the addition of an excess of acid.

Loss on drying—When dried over sulfuric acid for 4 hours, Phenolphthalein loses not more than 1 per cent of its weight.

Residue on ignition—Phenolphthalein yields not more than 0.1 per cent of residue on ignition, page 685.

Arsenic—Heat a platinum crucible to redness, and add, in small portions, an intimate mixture of 200 mg. of Phenolphthalein, 300 mg. of potassium nitrate, and about 500 mg. of anhydrous sodium carbonate. Maintain the mixture at a red heat until the reaction ceases, then boil the cooled residue with 10 cc. of diluted sulfuric acid for 5 minutes, filter, and wash the undissolved residue with 10 cc. of water. Evaporate the filtrate and washings until sulfur trioxide vapors are evolved: the residue, dissolved in 5 cc. of water, meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Heat 500 mg. of Phenolphthalein with 10 cc. of diluted hydrochloric acid on a water bath for 5 minutes, filter, and evaporate the filtrate to dryness. Add to the residue 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Phenolphthalein is 15 parts per million.

Color of solution—A solution of 500 mg. of Phenolphthalein in 30 cc. of alcohol is colorless.

Fluorane—One-half Gm. of Phenolphthalein dissolves completely in a mixture of 4 cc. of sodium hydroxide T.S. and 50 cc. of water.

Sensitiveness—A mixture of 50 cc. of cold, recently boiled water and 0.5 cc. of an alcohol solution of Phenolphthalein (1 in 100) requires not more than 0.25 cc. of fiftieth-normal sodium hydroxide to produce a pink color.

Packaging and storage—Preserve Phenolphthalein in well-closed containers.

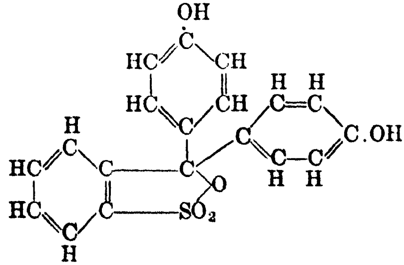
AVERAGE DOSE—**60 mg.** (approximately 1 grain).

Phenolsulfonphthalein

PHENOLSULFONPHTHALEIN

Phenolsulfonphthaleinum

Phenolsulfonphthal.—Phenol Red



$C_{19}H_{14}O_5S$ Mol. wt. 354.36

Description—Phenolsulfonphthalein occurs as a crystalline powder, varying in color from bright to dark red. It is stable in air.

Solubility—One Gm. of Phenolsulfonphthalein dissolves in about 1300 cc. of water and in about 350 cc. of alcohol. It is almost insoluble in chloroform and in ether. It is readily soluble in solutions of alkali hydroxides and their carbonates.

Identification—

A: Phenolsulfonphthalein dissolves in solutions of alkali hydroxides and carbonates, with colors varying from deep red in concentrated solutions to a violet tinted red in dilute solutions. The red color of these solutions is changed to orange or yellow by the addition of a slight excess of acid.

B: Dissolve about 5 mg. of Phenolsulfonphthalein in a few drops of sodium hydroxide T.S., add 2 cc. of tenth-normal bromine and 1 cc. of diluted hydrochloric acid, shake well, and allow to stand for 5 minutes. Make the solution alkaline with sodium hydroxide T.S.: an intense blue violet color is produced.

Loss on drying—When dried over sulfuric acid for 4 hours, Phenolsulfonphthalein loses not more than 1 per cent of its weight.

Residue on ignition—Phenolsulfonphthalein yields not more than 0.2 per cent of residue on ignition, page 685.

Arsenic—Heat a platinum crucible to redness, and add, in small portions, an intimate mixture of 200 mg. of Phenolsulfonphthalein, about 300 mg. of potassium nitrate and about 500 mg. of anhydrous sodium carbonate. Maintain the mixture at a red heat until the reaction ceases, boil the cooled residue for 5 minutes with 10 cc. of diluted sulfuric acid, filter, and wash the undissolved residue with 10 cc. of water. Evaporate the filtrate and washings until sulfur trioxide vapors are evolved: the residue, dissolved in 5 cc. of water, meets the requirements of the test for *Arsenic*, page 618.

Insoluble substances—To about 1 Gm. of Phenolsulfonphthalein, accurately weighed, add a filtered solution of 500 mg. of sodium bicarbonate in 20 cc. of water. Rotate the container frequently during 1 hour, dilute to 100 cc., and allow it to stand over night. Filter through counter-balanced filters or a tared filtering crucible, wash first with 25 cc. of a 1 per cent solution of sodium bicarbonate, then with 25 cc. of water, and dry to constant weight at 110°: the weight of the insoluble residue does not exceed 0.2 per cent of the weight of Phenolsulfonphthalein taken.

Sensitiveness—Fill a 100-cc. glass-stoppered flask with thoroughly boiled and cooled water to within a few cc. of the stopper. Add 1 cc. of an alcohol solution of Phenolsulfonphthalein (1 in 1000) and 0.5 cc. of fiftieth-normal sodium hydroxide, stopper the flask immediately, and mix well: the mixture is intensely red.

Packaging and storage—Preserve Phenolsulfonphthalein in well-closed containers.

Phenolsulfonphthalein Injection

PHENOLSULFONPHTHALEIN INJECTION

Injectio Phenolsulfonphthaleini

Inj. Phenolsulfonphthal.

Phenolsulfonphthalein Injection is a sterile solution of phenolsulfonphthalein rendered soluble with sodium bicarbonate or sodium hydroxide in isotonic sodium chloride solution made with water for injection. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_{19}H_{14}O_5S$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

The Injection may be prepared as follows, using proportional quantities for other strengths:

Phenolsulfonphthalein	6 Gm.
Sodium Chloride	9 Gm.
Sodium Bicarbonate	1.43 Gm.
Water for Injection, a sufficient quantity,	
To make	1000 cc.

To the phenolsulfonphthalein contained in a beaker of about 500-cc. capacity, add 100 cc. of water for injection, then dissolve the sodium bicarbonate, added in small portions, and with stirring. Add the sodium chloride, and boil the mixture gently until the volume of the solution has been reduced to about 70 cc. Filter through a pledget of sterile cotton into a suitable flask, and wash the filter with water for injection. Dilute to about 950 cc. with water for injection, and test the solution for sensitiveness as directed below. If necessary, adjust the solution so that it will conform to the test for sensitiveness by adding sufficient weak solution of sodium hydroxide. Then dilute with water for injection to 1000 cc., mix well, distribute into suitable containers, and sterilize preferably by Process C. See *Sterilization Processes*, page 692.

Note—The 1.43 Gm. of sodium bicarbonate may be replaced by 17 cc. of normal sodium hydroxide.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—To a volume of the Injection, equivalent to about 5 mg. of phenolsulfonphthalein, add 2 cc. of tenth-normal bromine and 1 cc. of diluted hydrochloric acid, shake well, allow to stand for 5 minutes, then make alkaline with sodium hydroxide T.S.: an intense blue violet color is produced.

Sensitiveness—Dilute a portion of the Injection with water to a concentration of about 1 mg. of phenolsulfonphthalein per 1 cc. of the dilution. Add 0.2 cc. of this dilution to 50 cc. of recently boiled and cooled water, then add 0.2 cc. of fiftieth-normal sodium hydroxide: a strong violet-tinted pink color is produced, which changes to pale yellow upon the addition of 0.2 cc. of fiftieth-normal sulfuric acid.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, equivalent to from 40 to 50 mg. of phenolsulfonphthalein, to an iodine flask. Add 10 cc. of water, and follow with 15 cc. of tenth-normal bromine. Add 2 cc. of hydrochloric acid, immediately stopper the flask, and shake the contents gently for 5 minutes. Quickly pour into the flask 5 cc. of a solution of potassium iodide (1 in 5), and immediately close the flask. Shake gently for 1 minute, then rinse the stopper and the neck of the flask with a few cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. near the end of the titration. Determine the normality of the tenth-normal bromine in the same manner as in the test. Each cc. of tenth-normal bromine is equivalent to 4.429 mg. of $C_{19}H_{14}O_5S$.

Packaging and storage—Preserve Phenolsulfonphthalein Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Phenolsulfonphthalein Injection usually available contains the following amount of phenolsulfonphthalein: 6 mg. ($\frac{1}{10}$ grain) in 1 cc.

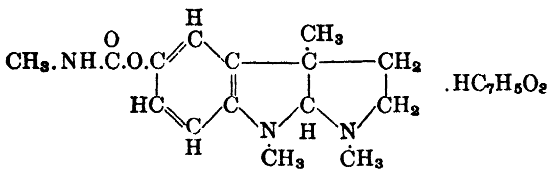
AVERAGE DOSE OF PHENOLSULFONPHTHALEIN—Diagnostic—Intravenous or intramuscular, **6 mg.** (approximately $\frac{1}{10}$ grain).

Physostigmine Salicylate

PHYSOSTIGMINE SALICYLATE

Physostigminæ Salicylas

Physostig. Salicyl.—Eserine Salicylate



$C_{15}H_{21}N_3O_2.HC_7H_5O_3$ Mol. wt. 413.46

Physostigmine Salicylate is the salicylate of an alkaloid usually obtained from the dried ripe seed of *Physostigma venenosum* Balfour (Fam. *Leguminosæ*).

Caution—Physostigmine Salicylate is extremely poisonous.

Description—Physostigmine Salicylate occurs as white or faintly yellow, shining, odorless crystals. It acquires a red tint when long exposed to light and air.

Solubility—One Gm. of Physostigmine Salicylate dissolves in 75 cc. of water, in 16 cc. of alcohol, in 6 cc. of chloroform, and in about 250 cc. of ether.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Physostigmine Salicylate determined in a solution containing, in each 100 cc., 1 Gm. of Physostigmine Salicylate, previously dried over sulfuric acid for 4 hours, and using a 200-mm. tube, is not less than $-91°$ and not more than $-94°$, page 675.

Identification—

A: Evaporate about 5 mg. of Physostigmine Salicylate on a water bath with a few drops of ammonia T.S.: a blue residue remains which, when dissolved in alcohol, yields a red, fluorescent solution upon the addition of an excess of acetic acid.

B: Add a few drops of sodium hydroxide T.S. to 5 cc. of a cold, saturated solution of Physostigmine Salicylate: a pink color rapidly develops.

C: Ferric chloride T.S. produces a deep violet color in a solution of Physostigmine Salicylate.

Reaction—A cold, saturated solution of Physostigmine Salicylate is neutral or only faintly acid to litmus paper.

Loss on drying—When dried over sulfuric acid for 4 hours, Physostigmine Salicylate loses not more than 2 per cent of its weight.
Residue on ignition—The residue on ignition of 100 mg. of Physostigmine Salicylate is negligible, page 685.
Sulfate—Precipitate the salicylic acid from 10 cc. of a cold, saturated solution of Physostigmine Salicylate with a slight excess of diluted hydrochloric acid, and filter: the filtrate is not rendered turbid at once by the addition of 5 drops of barium chloride T.S.
Readily carbonizable substances—Dissolve 100 mg. of Physostigmine Salicylate in 5 cc. of sulfuric acid: the solution, after standing for 5 minutes, has no more color than matching fluid I, page 680.
Packaging and storage—Preserve Physostigmine Salicylate in tight, light-resistant containers which hold not more than 1 Gm.

AVERAGE DOSE—**2 mg.** (approximately 1/30 grain).

Picrotoxin

PICROTOXIN

Picrotoxinum

$C_{30}H_{34}O_{13}$ Picrotox.—Cocculin Mol. wt. 602.57

Picrotoxin is an active principle obtained from the seed of *Anamirta Cocculus* (Linné) Wight et Arnott (Fam. *Menispermaceæ*).

Description—Picrotoxin occurs as flexible, shining, prismatic crystals or as a microcrystalline powder. It is odorless, and stable in air, but is affected by light. Its solutions are neutral to litmus paper.
Solubility—One Gm. of Picrotoxin dissolves in about 350 cc. of water, in about 5 cc. of boiling water, and in about 3 cc. of boiling alcohol. It is more readily soluble in diluted acids and alkalies. It is sparingly soluble in ether and in chloroform.
Melting range—Picrotoxin melts between 198° and 200°, page 667.
Identification—
A: Concentrated sulfuric acid dissolves Picrotoxin, forming a golden yellow solution which changes gradually to reddish brown.
B: Mix about 200 mg. of potassium nitrate with 3 or 4 drops of sulfuric acid in a suitable porcelain dish. Sprinkle a few particles of Picrotoxin on the mixture, and add sodium hydroxide solution (1 in 4), dropwise, until it is in excess: the particles of Picrotoxin acquire a red color which gradually fades.
C: Dilute 2 cc. of alkaline cupric tartrate T.S. with 10 cc. of water, and add a few particles of Picrotoxin: a red precipitate forms slowly in the cold, but rapidly upon boiling.
Residue on ignition—The residue on ignition of 200 mg. of Picrotoxin is negligible, page 685.
Alkaloids—A saturated solution of Picrotoxin yields no precipitate with platinic chloride T.S., tannic acid T.S., or mercuric potassium iodide T.S.
Packaging and storage—Preserve Picrotoxin in well-closed, light-resistant containers.

AVERAGE DOSE—Intravenous. To be determined by the physician according to the needs of the patient.

Picrotoxin Injection

PICROTOXIN INJECTION

Injectio Picrotoxini

Inj. Picrotox.

Picrotoxin Injection is a sterile solution of picrotoxin in isotonic sodium chloride solution. It contains, in each cc., not less than 90 per cent and not more than 110 per cent of the labeled amount of picrotoxin ($C_{30}H_{34}O_{13}$). It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Picrotoxin Injection preferably by Process F. See *Sterilization Processes*, page 692.

Alcohol or chlorobutanol may be added as a preservative. The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—

A: The picrotoxin obtained in the *Assay* melts between 197° and 200°, and responds to *Identification tests A, B,* and *C* under *Picrotoxin*, page 411.

B: Picrotoxin Injection responds to the test for *Sodium*, page 663, and for *Chloride*, page 659.

Limit of sodium chloride—Transfer 20 cc. of the Injection, accurately measured, to a glass-stoppered Erlenmeyer flask, and dilute with about 25 cc. of water. Add slowly, while agitating, exactly 10 cc. of tenth-normal silver nitrate, then add 3 cc. of nitric acid and 3 cc. of nitrobenzene, and shake well. Add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 5.845 mg. of NaCl. Not less than 850 mg. and not more than 950 mg. of NaCl is present in 100 cc. of the Injection.

Assay—Transfer to a separator an accurately measured volume of the Injection obtained in the test for *Determination of the Volume of Injection in Containers*, page 665, equivalent to about 50 mg. of picrotoxin. If the Injection contains alcohol, evaporate at first sufficiently to expel the alcohol, then transfer completely to the separator. Add 1 cc. of diluted hydrochloric acid, and extract the picrotoxin completely by shaking with several successive portions of chloroform, until 2 cc. of the last chloroform extract leaves no weighable residue upon evaporation on a steam bath. Wash the combined chloroform extract with two 10-cc. portions of water, slightly acidulated with hydrochloric acid, then extract the combined water washings with 10 cc. of chloroform, and add it to the main chloroform solution. Evaporate the combined chloroform extracts on a steam bath in a tared vessel, dry at 100° for 2 hours, cool, and weigh. The weight so obtained represents the weight of the picrotoxin in the volume of the solution taken for the assay.

Packaging and storage—Preserve Picrotoxin Injection preferably in hermetic, single-dose containers, or in other suitable containers. See *Containers for Injections*, page 630. Protect the Injection from light.

Sizes—Picrotoxin Injection usually available contains the following amount of picrotoxin: 3 mg. ($\frac{1}{20}$ grain) in 1 cc.

AVERAGE DOSE OF PICROTOXIN—Intravenous. To be determined by the physician according to the needs of the patient.

Pills

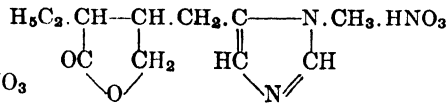
PAGE
Hexylresorcinol Pills. . 254

Pilocarpine Nitrate

PILOCARPINE NITRATE

Pilocarpinæ Nitras

Pilocarpin. Nitras



$C_{11}H_{16}N_2O_2.HNO_3$ Mol. wt. 271.27

Pilocarpine Nitrate is the nitrate of an alkaloid obtained from the dried leaflets of *Pilocarpus Jaborandi* Holmes, or of *Pilocarpus microphyllus* Stapf (Fam. *Rutaceæ*).

Description—Pilocarpine Nitrate occurs as shining, white crystals. It is stable in air but is affected by light. Its solutions are slightly acid to litmus paper.

Solubility—One Gm. of Pilocarpine Nitrate dissolves in 4 cc. of water and in 75 cc. of alcohol. It is insoluble in chloroform and in ether.

Melting range—Pilocarpine Nitrate melts between 170° and 173°, page 667.

Identification—

A: Dissolve about 15 mg. of Pilocarpine Nitrate in 2 cc. of water in a test tube, add 2 cc. of faintly acid hydrogen peroxide T.S., and cover the mixture with about 1 cc. of benzene. Add 3 or 4 drops of a solution of potassium dichromate (1 in 300), and shake the mixture gently: the benzene layer acquires a violet color, while the water layer remains yellow.

B: Mix a solution of Pilocarpine Nitrate (1 in 10) with an equal volume of ferrous sulfate T.S., and superimpose the mixture upon 5 cc. of sulfuric acid, contained in a test tube: the zone of contact becomes brown.

Loss on drying—When dried over sulfuric acid for 4 hours, Pilocarpine Nitrate loses not more than 2 per cent of its weight.

Residue on ignition—The residue on ignition of 200 mg. of Pilocarpine Nitrate is negligible, page 685.

Chloride—Add a few drops of silver nitrate T.S. to 5 cc. of a solution of Pilocarpine Nitrate (1 in 50), acidified with nitric acid: no opalescence is produced at once.

Readily carbonizable substances—Dissolve 100 mg. of Pilocarpine Nitrate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Various foreign alkaloids—Add a few drops of ammonia T.S. or of potassium dichromate T.S. to 10 cc. of a solution of Pilocarpine Nitrate (1 in 100): no turbidity is produced.

Packaging and storage—Preserve Pilocarpine Nitrate in tight, light-resistant containers.

AVERAGE DOSE—**5 mg.** (approximately 1/12 grain).

PAGE
Pine Tar. 554
Pine Tar Ointment. . 555

Pituitary, Posterior

POSTERIOR PITUITARY

Pituitarium Posterius

Pituitar. Post.—Pituitary, Hypophysis Sicca

Posterior Pituitary is the cleaned, dried, and powdered posterior lobe obtained from the pituitary body of domesticated animals which are used for food by man. The pituitary body must be removed from the animal immediately after slaughtering and then dried at once or kept frozen until dried. The potency of Posterior Pituitary shall be such that 1 mg. shall possess an activity equivalent to not less than 1 U. S. P. Posterior Pituitary Unit.*

Description—Posterior Pituitary occurs as a yellowish or grayish, amorphous powder and has a characteristic odor.

Solubility—Posterior Pituitary is only partially soluble in water.

Assay—Carefully weigh a suitable amount of Posterior Pituitary and prepare a solution from it, following the directions given for the preparation of a solution of the U. S. P. Posterior Pituitary Reference Standard as directed in the first paragraph of the *Assay* for *Posterior Pituitary Injection* below. Assay this solution as directed under the *Assay* for *Posterior Pituitary Injection* below.

Packaging and storage—Preserve Posterior Pituitary in well-closed containers, preferably at a temperature not above 30°.

Pituitary, Posterior, Injection

POSTERIOR PITUITARY INJECTION

Injectio Pituitarii Posterioris

Inj. Pituitar. Post.—Posterior Pituitary Solution, Pituitary Solution

Posterior Pituitary Injection is a sterile solution in water for injection of the water-soluble principle or principles from the posterior lobe of the pituitary body of healthy domesticated animals used for food by man. The pituitary body must have been removed from the animal immediately after slaughtering, and then dried or extracted at once or kept frozen until extracted. *The potency of Posterior Pituitary Injection shall be such that 0.1 cc. of the Injection shall possess an activity equivalent to one*

* The potency of 0.5 mg. of the U. S. P. Posterior Pituitary Reference Standard represents 1 U. S. P. Unit.

*U. S. P. Posterior Pituitary Unit.** It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Posterior Pituitary Injection preferably by Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Description—Posterior Pituitary Injection is a clear or only faintly opalescent liquid, colorless, or nearly so, and having a faint, characteristic odor.

Assay—Prepare a standard solution as follows: Carefully weigh a suitable amount of U. S. P. Posterior Pituitary Reference Standard, place it in a small agate or glass mortar, and moisten with a few drops of water containing 0.25 per cent of acetic acid. Triturate the moistened powder thoroughly until the whole has an impalpable, frothy consistence. Add a few cc. of the 0.25 per cent acetic acid, and stir the mixture thoroughly. Transfer to an Erlenmeyer flask; rinse the mortar with the acetic acid solution, and add the rinsings to the pituitary mixture; then add enough 0.25 per cent acetic acid to make the final volume of the mixture contain the same number of cc. as the number of milligrams of U. S. P. Posterior Pituitary Reference Standard originally taken. Place a small, shortened funnel in the mouth of the flask, heat the mixture to the boiling point for not more than 1 minute, and filter. The filtrate contains in each cc. the active principle of 1 mg. of the reference standard. Place this standard solution in hard glass ampuls and sterilize by fractional sterilization for 20 minutes on each of three successive days at a temperature of flowing steam but not exceeding 100°. Preserve in a cool place (from 5° to 20°). This standard solution should not be kept more than 6 months.

The apparatus used for making the test may be any modification of the general type for recording the activity of the isolated smooth muscle of mammals. It must be provided with an accurate temperature regulating device. The temperature of the bath should be between 37° and 38° but should not vary more than one-tenth of a degree throughout the assay. The chamber in which the uterus is suspended should have a capacity of not less than 100 cc.

Use healthy guinea pigs weighing between 175 Gm. and 350 Gm. They should not have been pregnant and should not be in heat. It is recommended that young female guinea pigs be segregated at the time of weaning and kept thereafter out of sight and smell of the males.

Kill a guinea pig by a blow on the head, or by decapitation, and immediately remove the entire uterus from the body. Suspend one horn of the uterus in a chamber containing oxygenated Locke-Ringer's solution (page 839), one end of the horn being attached to a muscle lever. The lever may be weighted if necessary, but the amount of weight attached to the lever must not be changed while the contractions constituting the assay are being obtained. When the uterus is completely relaxed, which is generally in from 15 to 30 minutes, the assay may be started. Dilute with isotonic sodium chloride solution suitable quantities of the standard solution and of the preparation to be assayed. Determine the quantity of the diluted standard solution and the quantity of the diluted preparation to be assayed which, when standard and unknown are administered alternately, will elicit a series of four contractions of approximately the same height. Then administer a third dose of the diluted standard solution 25 per cent larger than the two preceding doses of the diluted standard solution. Measure the height of each of the five contractions. The first four contractions are to be considered to be submaximal and equivalent, and to constitute an assay, if the difference in height between the highest and lowest of these four is less than half the difference in height between the lowest of the four and the contraction resulting from the increased dose of reference standard. From the quantities required to produce these equivalent

* The potency of 0.5 mg. of the U. S. P. Posterior Pituitary Reference Standard represents 1 U. S. P. Unit.

contractions, calculate the strength, in U. S. P. Posterior Pituitary Units, of the preparation assayed.

NOTE—Owing to the many variable factors in the assay of Solution of Posterior Pituitary, evidence of potency in all assays to within 20 per cent above or below the standard is acceptable.

Packaging and storage—Preserve Posterior Pituitary Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Posterior Pituitary Injection usually available contains the following amounts of posterior pituitary: 0.5 cc. (5 U. S. P. Units); 1 cc. (10 U. S. P. Units).

AVERAGE DOSE OF POSTERIOR PITUITARY—Intramuscular, 1 cc. (approximately 15 minims).

Plague Vaccine

PLAGUE VACCINE

Vaccinum Pestis

Vac. Pest.

Plague Vaccine is a sterile suspension of killed plague bacilli (*Pasteurella pestis*), of a strain selected for high antigenic efficiency, in isotonic sodium chloride solution or other suitable diluent. The Vaccine shall contain, in each cc., at least 2,000 million plague organisms. Plague Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Plague Vaccine is a more or less turbid, whitish liquid, nearly odorless, or having a faint odor due to the presence of a preservative. It shall be free from harmful substances detectable by animal inoculation and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The outside label must indicate the number of organisms represented in each cc., the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by the National Institute of Health of the United States Public Health Service.

Preservation and storage—Preserve Plague Vaccine at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, **0.5 cc.** and **1 cc.**, with a 7 to 10 days' interval, the latter dose preferably to be repeated once.

Plasma, Citrated Normal Human

CITRATED NORMAL HUMAN PLASMA

Plasma Humanum Normale Citratum

Plas. Human. Nor. Citr.—Normal Human Plasma

Citrated Normal Human Plasma is the sterile plasma obtained by pooling approximately equal amounts of the liquid portion of citrated whole blood from eight or more humans (*Homo sapiens* Linné) who have been certified by a qualified doctor of medicine as free from any disease which is transmissible by blood transfusion at the time of the drawing of the blood. Each bleeding is drawn under aseptic precautions into individual sterile centrifuge bottles already containing 50 cc. of a sterile, 4 per cent solution of sodium citrate in isotonic sodium chloride solution for each 500 cc. of whole blood. The cell-free plasma is separated by centrifugation, and transferred to a pool by means of a closed system. Sterility tests are made, a preservative is added, and the plasma is distributed into final containers through a closed system. Citrated Normal Human Plasma complies with the requirements of the National Institute of Health of the United States Public Health Service.

Citrated Normal Human Plasma may be dispensed as liquid plasma, as frozen plasma, or as dried plasma. Citrated Normal Human Plasma must be free from harmful substances detectable by animal inoculation, and must not contain an excessive amount of preservative.

Description—(*a*) *Liquid plasma:* Freshly collected citrated human plasma is a slightly opalescent liquid of a faint yellowish or amber color and is practically odorless in the absence of a preservative possessing an odor; it contains no visible particles and is free of cellular elements save for a variable number of blood platelets. Increased opalescence or a precipitate of fibrin may develop on standing. As a stabilizing agent, liquid plasma shall contain 5 per cent of dextrose.

(*b*) *Frozen plasma:* This is made from citrated liquid normal human plasma, frozen quickly, within 72 hours of bleeding. As a stabilizing agent, frozen plasma shall contain 5 per cent of dextrose. It is imperative that frozen plasma be kept continuously in the frozen state until liquefied by placing in a water bath at 37°.

(*c*) *Dried plasma:* This is made from frozen plasma without added dextrose by drying from the frozen state under vacuum. It contains not more than 1 per cent of moisture as determined by exposing 1 or 2 Gm. of the sample, evenly distributed in a weighing bottle of not less than 60 mm. diameter, in a vacuum desiccator at less than 1 mm. pressure, at room temperature, over fresh phosphorus pentoxide until the weight remains constant to the third decimal. It has a light yellow to deep cream color, is microscopically of a honeycomb-like structure, and shows no evidence of fusion. Dried plasma is restored to the original volume by dissolving completely in a sterile 0.1 per cent solution of citric acid in water for injection, page 601, and is administered immediately.

Regulations—The outside label must bear the name *Citrated Normal Human Plasma* and indicate the volume of original normal human plasma represented in the container, the manufacturer's lot number of the plasma, the name, address, and the license number of the manufacturer, and the date beyond which the quality of the contents may not be maintained.

Packaging and storage—Preserve liquid plasma at a temperature between 15° and 30°, and frozen plasma at a temperature of or under minus 15°. Dried plasma must not be exposed to excessive heat. Citrated Normal Human Plasma must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intravenous, **500 cc.**

Plaster, Adhesive

ADHESIVE PLASTER

Emplastrum Adhæsivum

Emp. Adhæs.—Adhesive Tape

Description—Adhesive Plaster consists of a mixture, having pressure-sensitive adhesive properties, spread evenly upon fabric, the back of which may be coated with a water-repellent film. The plaster mass is free from lumps. The plaster has a tensile strength, determined warpwise, of not less than 20.41 Kg. (45 pounds) per 2.54 cm. (1 inch) of width.

Dimensions—The actual length of Adhesive Plaster is not less than 98 per cent of the labeled length of the Plaster. Measure the width of the Plaster at 5 points evenly spread along the center line of the Plaster: the average of 5 measurements is not more than 1.6 mm. ($\frac{1}{16}$ inch) less than the labeled width of the Plaster.

Tensile strength—Determine the tensile strength of Adhesive Plaster, unrolled and conditioned for at least 4 hours in a standard atmosphere of 65 per cent ±2 per cent relative humidity, at 21° ±1.1° (70° F. ±2° F.), with a pendulum-type testing machine, as described under *Tensile Strength Determination*, page 699, converting the values actually obtained to Kg. (pounds) per 2.54 cm. (1 inch) of width.

Adhesive strength—Cut a strip of Adhesive Plaster 2.54 cm. (1 inch) wide and approximately 15 cm. (6 inches) long, and apply 12.90 sq. cm., 2.54 cm. by 5.08 cm. (2 square inches, 1 by 2 inches) of one end of the strip to a clean bakelite surface by means of a rubber roller under a pressure of 850 Gm. (1.87 pounds), passing the roller twice over the Plaster at a rate of 30 cm. (12 inches) per minute. Adjust the temperature of the bakelite surface and the Plaster to 37°, and conduct the test immediately thereafter as directed under *Tensile Strength Determination*, page 699, using a pendulum-type testing machine, the pull being exerted parallel with the warp and the bakelite: the average of not less than 10 tests is not less than 17 Kg. (40 pounds).

Packaging and storage—Preserve Adhesive Plaster preferably at a temperature not above 30° and do not expose to sunlight.

Plaster, Adhesive, Sterile

STERILE ADHESIVE PLASTER

Emplastrum Adhæsivum Sterile

Emp. Adhæs. Steril.—Sterile Adhesive Tape

Description—Sterile Adhesive Plaster consists of a mixture which has pressure-sensitive properties, spread evenly upon fabric, the back of which may be coated with a water-repellent film. The plaster mass is free from lumps.

The adhesive surface is protected by strips of Holland cloth or other protective material of not less than the width of the Plaster.

Sterile Adhesive Plaster is protected from contamination by suitable packaging and must be sterilized after packaging.

Sterility—Sterile Adhesive Plaster meets the requirements of the *Sterility Tests for Solids*, page 689.

Other requirements—Sterile Adhesive Plaster meets the requirements for *Dimensions*, and for *Tensile strength* and *Adhesive strength* under *Adhesive Plaster*, page 699.

Packaging and storage—Each Sterile Adhesive Plaster unit is so packaged individually that the sterility of the unit is maintained until the package is opened for use. Each Sterile Adhesive Plaster unit is sterilized in the package.

Preserve Sterile Adhesive Plaster preferably at a temperature not above 30° and do not expose to sunlight.

Labeling—The label shall bear a statement to the effect that the sterility of the Plaster cannot be guaranteed if the package bears evidence of damage or has been previously opened. The length and width of the Plaster shall be stated upon the package.

Plasters

Potassium Acetate

POTASSIUM ACETATE

Potassii Acetas

Pot. Acet.

$KC_2H_3O_2$ Mol. wt. 98.14

Potassium Acetate, when dried to constant weight at 150°, contains not less than 99 per cent of $KC_2H_3O_2$.

Description—Potassium Acetate occurs as colorless, monoclinic crystals or as a white, crystalline powder. It has a saline and slightly alkaline taste. Potassium Acetate deliquesces on exposure to moist air.

Solubility—One Gm. of Potassium Acetate dissolves in 0.5 cc. of water and in 3 cc. of alcohol. One Gm. of it dissolves in about 0.2 cc. of boiling water.

Identification—A solution of Potassium Acetate (1 in 10) responds to the tests for *Potassium*, page 663, and for *Acetate*, page 658.

Free alkali—A solution of Potassium Acetate (1 in 20) is alkaline to litmus paper, but does not affect phenolphthalein T.S.

Arsenic—A solution of Potassium Acetate meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Dissolve 1 Gm. of Potassium Acetate in 10 cc. of water, add 3.5 cc. of diluted hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Potassium Acetate is 20 parts per million.

Assay—Dry Potassium Acetate to constant weight at 150°, and proceed as directed under the assay for *Alkali Salts of Organic Acids*, page 617. Each cc. of half-normal sulfuric acid is equivalent to 49.07 mg. of $KC_2H_3O_2$.
Packaging and storage—Preserve Potassium Acetate in tight containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

Potassium Arsenite Solution

POTASSIUM ARSENITE SOLUTION

Liquor Potassii Arsenitis

Liq. Pot. Arsen.—Fowler's Solution, Solutio arsenicalis seu Fowleri P.I.

Potassium Arsenite Solution contains, in each 100 cc., the equivalent of not less than 0.95 Gm. and not more than 1.05 Gm. of As_2O_3.

ARSENIC TRIOXIDE	10	Gm.
POTASSIUM BICARBONATE	7.6	Gm.
ALCOHOL	30	cc.
DISTILLED WATER, a sufficient quantity,		
To make	1000	cc.

Boil the potassium bicarbonate and arsenic trioxide in a flask with 100 cc. of distilled water until solution is effected. Cool the solution, and transfer it to a 1000-cc. graduated container, rinsing the flask in which the liquid was boiled with several portions of distilled water to make a solution measuring 950 cc. Add the alcohol and sufficient distilled water to make the solution measure 1000 cc. Mix thoroughly, and filter if necessary.

Description—Potassium Arsenite Solution is a clear, colorless liquid, alkaline to litmus paper.
Identification—Add to 10 cc. of Potassium Arsenite Solution an excess of hydrochloric acid and an equal volume of hydrogen sulfide T.S.: a yellow precipitate is produced which is soluble in ammonium carbonate T.S.
Arsenate—Acidify 4 cc. of Potassium Arsenite Solution with diluted nitric acid, add 1 cc. of silver nitrate T.S., and superimpose a layer of ammonia T.S. upon this liquid: no red or reddish brown color is observed at the line of contact.
Assay—Measure exactly 20 cc. of Potassium Arsenite Solution, dilute with 75 cc. of water, acidify the mixture very slightly with diluted hydrochloric acid, then dissolve in the solution 2 Gm. of sodium bicarbonate, and titrate the resulting liquid with tenth-normal iodine, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 4.946 mg. of As_2O_3.
Alcohol content—From 1 to 3 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Potassium Arsenite Solution in tight containers.

AVERAGE DOSE—**0.2 cc.** (approximately 3 minims).

POTASSIUM BICARBONATE

Potassii Bicarbonas

Pot. Bicarb.

$KHCO_3$ Mol. wt. 100.11

Potassium Bicarbonate, when dried for 4 hours over sulfuric acid, contains not less than 99 per cent of $KHCO_3$.

Description—Potassium Bicarbonate occurs as colorless, transparent, monoclinic prisms or as a white, granular powder. It is odorless, and has a saline and slightly alkaline taste. It is stable in air. Its solutions are slightly alkaline to litmus paper, and neutral or very slightly alkaline to phenolphthalein T.S.

Solubility—One Gm. of Potassium Bicarbonate dissolves in 2.8 cc. of water. It is almost insoluble in alcohol.

Identification—A solution of Potassium Bicarbonate (1 in 10) responds to the tests for *Potassium*, page 663, and for *Bicarbonate*, page 659.

Normal carbonate—Add 2 cc. of tenth-normal hydrochloric acid and 2 drops of phenolphthalein T.S. to 1 Gm. of Potassium Bicarbonate, previously dissolved without agitation in 20 cc. of water at a temperature not above 15°: the mixture does not at once assume a red tint.

Heavy metals—To 2 Gm. of Potassium Bicarbonate add 5 cc. of water and 8 cc. of diluted hydrochloric acid, heat to boiling, and maintain that temperature for 1 minute. Add 1 drop of phenolphthalein T.S. and sufficient ammonia T.S., dropwise, to give the solution a faint pink color. Cool, add 2 cc. of diluted acetic acid, and dilute with water to 25 cc.: the heavy metals limit, page 657, for Potassium Bicarbonate is 10 parts per million.

Assay—Dry about 4 Gm. of Potassium Bicarbonate for 4 hours over sulfuric acid, weigh accurately, dissolve it in 25 cc. of water, and titrate with normal sulfuric acid, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 100.1 mg. of $KHCO_3$.

Packaging and storage—Preserve Potassium Bicarbonate in well-closed containers.

POTASSIUM BROMIDE

Potassii Bromidum

Pot. Bromid.

KBr Mol. wt. 119.01

Potassium Bromide, when dried at 110° for 4 hours, contains not less than 99 per cent of KBr.

Description—Potassium Bromide occurs as white, odorless, cubical crystals or as a granular powder. It is stable in air.

Solubility—One Gm. of Potassium Bromide dissolves in 1.5 cc. of water, in 250 cc. of alcohol, and in 5 cc. of glycerin.

Identification—A solution of Potassium Bromide (1 in 5) responds to the tests for *Potassium*, page 663, and for *Bromide*, page 659.

Loss on drying—When dried at 110° for 4 hours, Potassium Bromide loses not more than 1 per cent of its weight.
Free alkali—Dissolve 1 Gm. of Potassium Bromide in 10 cc. of water, add 0.1 cc. of tenth-normal sulfuric acid and 1 drop of phenolphthalein T.S., and heat to boiling: the solution remains colorless.
Bromate—Drop 1 cc. of diluted sulfuric acid upon about 1 Gm. of the powdered salt: no yellow color appears at once.
Iodide—Add a few drops of ferric chloride T.S. to 10 cc. of a solution of Potassium Bromide (1 in 20), shake the mixture, and add 1 cc. of chloroform: the latter does not acquire a violet tint.
Sulfate—A solution of 2 Gm. of Potassium Bromide in 50 cc. of water shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.
Arsenic—A solution of Potassium Bromide meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfuric and sulfurous acids.
Barium—A 10-cc. portion of a solution of Potassium Bromide (1 in 20), when acidified with hydrochloric acid, is not immediately rendered turbid by the addition of 1 cc. of potassium sulfate T.S.
Heavy metals—Dissolve 2 Gm. of Potassium Bromide in 10 cc. of water, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Potassium Bromide is 10 parts per million.
Assay—Weigh accurately about 400 mg. of Potassium Bromide, previously dried at 110° for 4 hours, and dissolve in 50 cc. of water. Add 50 cc. of tenth-normal silver nitrate, 2 cc. of ferric ammonium sulfate T.S., and 2 cc. of nitric acid, and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 11.90 mg. of KBr. Each Gm. of Potassium Bromide, previously dried, is equivalent to not less than 83.2 cc. and not more than 84.5 cc. of tenth-normal silver nitrate.
Packaging and storage—Preserve Potassium Bromide in well-closed containers

AVERAGE DOSE—1 Gm. (approximately 15 grains).

Potassium Carbonate

POTASSIUM CARBONATE

Potassii Carbonas

Pot. Carb.

$K_2CO_3.1\frac{1}{2}H_2O$ Mol. wt. 165.23

Potassium Carbonate, when dried to constant weight at 180°, contains not less than 99 per cent of K_2CO_3.

Description—Potassium Carbonate is a white, granular powder. It is odorless, has a strongly alkaline taste, and is very deliquescent. Its solutions are strongly alkaline to litmus paper and to phenolphthalein T.S.
Solubility—One Gm. of Potassium Carbonate dissolves in 1 cc. of water, and in about 0.7 cc. of boiling water. It is insoluble in alcohol.
Identification—A solution of Potassium Carbonate (1 in 10) responds to the tests for *Potassium*, page 663, and for *Carbonate*, page 659.
Loss on drying—Dry about 3 Gm. of Potassium Carbonate, accurately weighed, to constant weight at 180°: its loss in weight is not less than 10 per cent and not more than 16.5 per cent.
Insoluble substances—No residue is left on dissolving 1 Gm. of Potassium Carbonate in 20 cc. of water.

Arsenic—A solution of Potassium Carbonate meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—To 1 Gm. of Potassium Carbonate add 2 cc. of water and 6 cc. of diluted hydrochloric acid. Heat to boiling and maintain that temperature for 1 minute. Add 1 drop of phenolphthalein T.S. and sufficient ammonia T.S., dropwise, to give the solution a faint pink color. Cool, add 2 cc. of diluted acetic acid, and dilute to 25 cc.: the heavy metals limit, page 657, for Potassium Carbonate is 20 parts per million.

Assay—Weigh accurately, in a stoppered weighing-bottle, about 2.5 Gm. of the dried Potassium Carbonate obtained in the test for *Loss on drying*, dissolve it in 25 cc. of water, and titrate with normal sulfuric acid, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 69.10 mg. of K_2CO_3.

Packaging and storage—Preserve Potassium Carbonate in tight containers.

Potassium Chloride

POTASSIUM CHLORIDE

Potassii Chloridum

Pot. Chlorid.

KCl Mol. wt. 74.55

Potassium Chloride, when dried for 2 hours at 110°, contains not less than 99 per cent of KCl.

Description—Potassium Chloride occurs as colorless, elongated, prismatic, or cubical crystals, or as a white, granular powder. It is odorless, has a saline taste, and is permanent in air. Its solutions are neutral to litmus paper.

Solubility—One Gm. of Potassium Chloride dissolves in 2.8 cc. of water, and in about 2 cc. of boiling water. It is insoluble in alcohol.

Identification—A solution of Potassium Chloride (1 in 20) responds to the tests for *Potassium*, page 663, and for *Chloride*, page 659.

Loss on drying—When dried at 110° for 2 hours, Potassium Chloride loses not more than 1 per cent of its weight.

Free acid or alkali—To a solution of 5 Gm. of Potassium Chloride in 50 cc. of recently boiled and cooled water add 3 drops of phenolphthalein T.S.: no pink color is produced. On the subsequent addition of 0.3 cc. of fiftieth-normal sodium hydroxide, a pink color is produced.

Iodide or bromide—Dissolve 2 Gm. of Potassium Chloride in 6 cc. of water, add 1 cc. of chloroform, and then add, dropwise, with constant agitation, 5 cc. of half-strength chlorine T.S.: the chloroform does not acquire a transient violet or permanent orange color.

Arsenic—A solution of Potassium Chloride meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfuric and sulfurous acids.

Calcium and magnesium—To 20 cc. of a solution of Potassium Chloride (1 in 100) add 2 cc. each of ammonia T.S., ammonium oxalate T.S., and sodium phosphate T.S.: no turbidity is produced in 5 minutes.

Heavy metals—Dissolve 2 Gm. of Potassium Chloride in 20 cc. of water, add 2 cc. of diluted acetic acid, and dilute with water to make 25 cc.: the heavy metals limit, page 657, for Potassium Chloride is 10 parts per million.

Sodium—A solution of Potassium Chloride (1 in 20), tested on a platinum wire, does not impart a pronounced yellow color to a non-luminous flame.

Assay—Dry about 250 mg. of Potassium Chloride for 2 hours at 110°, weigh accurately, and dissolve it in 50 cc. of water in a glass-stoppered flask. Add, while agitating, 50 cc. of tenth-normal silver nitrate, 3 cc. of nitric acid, and 3 cc. of nitrobenzene, shake vigorously, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 7.455 mg. of KCl.
Packaging and storage—Preserve Potassium Chloride in well-closed containers.

Potassium Chloride Tablets

POTASSIUM CHLORIDE TABLETS

Tabellæ Potassii Chloridi

Tab. Pot. Chlorid.

Potassium Chloride Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of KCl.

Identification—A solution of Potassium Chloride Tablets responds to the tests for *Potassium*, page 663, and for *Chloride*, page 659.
Calcium and magnesium—To 20 cc. of a solution of the Tablets (1 in 100), filtered if necessary, add 2 cc. each of ammonia T.S., ammonium oxalate T.S., and sodium phosphate T.S.: no turbidity is produced in 5 minutes.
Sodium—A solution of the Tablets (1 in 20), tested on a platinum wire, does not impart a pronounced yellow color to a non-luminous flame.
Assay—Dissolve a counted number of not less than 20 Potassium Chloride Tablets in sufficient water to make 500 cc., and mix well. Transfer an accurately measured aliquot of the solution, equivalent to about 250 mg. of potassium chloride, to a glass-stoppered flask, and dilute with 25 cc. of water. Add, while agitating, exactly 50 cc. of tenth-normal silver nitrate, and then add 3 cc. of nitric acid. Add 3 cc. of nitrobenzene, shake vigorously, then add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 7.455 mg. of KCl.

If the Tablets are coated or colored, proceed as follows: Weigh a counted number of not less than 20 of the Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered Tablets, equivalent to about 250 mg. of potassium chloride, and ignite at a temperature of about 350° to 400° for 15 minutes. To the cooled residue add 20 cc. of hot water, and heat on a steam bath for 5 minutes, breaking up any lumps with a glass rod. Filter into a glass-stoppered flask and wash the vessel in which the ignition was made and the residue with 5-cc. portions of hot water until a drop of the washings, diluted with a few drops of water, shows no opalescence on the addition of a drop of silver nitrate T.S. Cool, then proceed as in the preceding paragraph, beginning with "Add, while agitating, exactly 50 cc. of tenth-normal silver nitrate."
Packaging and storage—Preserve Potassium Chloride Tablets in well-closed containers.
Sizes—Potassium Chloride Tablets usually available contain the following amounts of potassium chloride: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DOSE OF POTASSIUM CHLORIDE, **1 Gm.** (approximately 15 grains).

POTASSIUM CITRATE

Potassii Citras

Pot. Cit.

$K_3C_6H_5O_7.H_2O$ $C_3H_4.OH.(COOK)_3.H_2O$ **Mol. wt. 324.40**

Potassium Citrate, when rendered anhydrous by drying at 180°, contains not less than 99 per cent of $K_3C_6H_5O_7$.

Description—Potassium Citrate occurs as transparent crystals, or as a white, granular powder. It is oderless, has a cooling, saline taste, and is deliquescent when exposed to moist air.

Solubility—One Gm. of Potassium Citrate dissolves in 1 cc. of water. It is almost insoluble in alcohol.

Identification—A solution of Potassium Citrate (1 in 10) responds to the tests for *Potassium*, page 663, and for *Citrate*, page 660.

Loss on drying—Weigh accurately about 2.5 Gm. of Potassium Citrate, and dry it to constant weight at 180°. The loss in weight is not less than 3 per cent and not more than 6 per cent.

Free alkali—A solution of Potassium Citrate (1 in 20) is alkaline to litmus paper, but no pink color is produced in a 10-cc. portion of the solution by the addition of 1 drop of phenolphthalein T.S.

Tartrate—A solution of 1 Gm. of Potassium Citrate in 1.5 cc. of water does not deposit a crystalline precipitate on the addition of 1 cc. of acetic acid when the walls of the test tube are scratched with a glass rod.

Heavy metals—Dissolve 2 Gm. of Potassium Citrate in 10 cc. of water, add 6 cc. of diluted hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Potassium Citrate is 10 parts per million.

Assay—Weigh accurately about 2 Gm. of the dried Potassium Citrate obtained in the determination of *Loss on drying*, and proceed as directed under *Alkali Salts of Organic Acids*, page 617. Each cc. of half-normal sulfuric acid is equivalent to 51.07 mg. of $K_3C_6H_5O_7$.

Packaging and storage—Preserve Potassium Citrate in tight containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

EFFERVESCENT POTASSIUM CITRATE

Potassii Citras Effervescens

Pot. Cit. Eff.

POTASSIUM CITRATE	200 Gm.
SODIUM BICARBONATE, in dry powder	477 Gm.
TARTARIC ACID, in dry powder	252 Gm.
CITRIC ACID, uneffloresced	162 Gm.
To make about	1000 Gm.

Dry the potassium citrate on a water bath until it ceases to lose weight, and powder the dried salt. Mix this intimately with the powdered citric and tartaric acids, and thoroughly incorporate the sodium bicarbonate. Place the mixed powders on a plate of glass or in a suitable dish in an oven, previously heated to between 93° and 104°. Manipulate carefully with a spatula which is acid-resistant, until the mixture becomes moist, rub it through a No. 6 tinned-iron sieve, and dry the granules at a temperature not exceeding 54°. Immediately transfer the salt to suitable containers and seal them tightly. Care must be taken to prevent the product from coming in contact with air containing moisture.

NOTE—The proportions of tartaric acid and citric acid may be varied, if desired, but their combined acidity must correspond to the acidity indicated in the official formula and the percentage of potassium citrate must be maintained.

Packaging and storage—Preserve Effervescent Potassium Citrate in tight containers.

AVERAGE DOSE—**4 Gm.** (approximately 60 grains).

Potassium Hydroxide

POTASSIUM HYDROXIDE

Potassii Hydroxidum

Pot. Hydrox.—Caustic Potash

KOH Mol. wt. 56.10

Potassium Hydroxide contains not less than 85 per cent of total alkali, calculated as KOH, of which not more than 3.5 per cent is K_2CO_3.

Caution—Great care is necessary in handling Potassium Hydroxide, as it rapidly destroys organic tissues.

Description—Potassium Hydroxide occurs in white, or nearly white, fused masses, in small pellets, in flakes, in sticks, and in other forms. It is hard and brittle and shows a crystalline fracture. Exposed to air, Potassium Hydroxide rapidly absorbs carbon dioxide and moixture, and deliquesces. Its solutions, even when greatly diluted, are strongly alkaline to litmus paper.

Solubility—One Gm. of Potassium Hydroxide dissolves in 1 cc. of water, in about 3 cc. of alcohol, and in about 2.5 cc. of glycerin. It is very soluble in boiling alcohol.

Identification—A solution of Potassium Hydroxide (1 in 25) responds to the tests for *Potassium*, page 663.

Heavy metals—Dissolve 1 Gm. of Potassium Hydroxide in 5 cc. of water and 7 cc. of diluted hydrochloric acid. Heat to boiling, add 1 drop of phenolphthalein T.S. and then sufficient ammonia T.S., dropwise, to give the solution a faint pink color. Add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Potassium Hydroxide is 30 parts per million.

Insoluble substances—Dissolve 1 Gm. of Potassium Hydroxide in 20 cc. of water: the solution is complete, clear, and colorless.

Assay—Dissolve about 1.5 Gm. of Potassium Hydroxide, accurately weighed, in 40 cc. of recently boiled and cooled water. Cool the solution to 15°, and titrate with normal sulfuric acid, using phenolphthalein T.S. as the indicator. At the discharge of the pink color of the indicator, record the volume of acid solution required, then add 3 drops of methyl orange T.S., and continue the titration to the production of a persistent pink color. Each cc. of normal sulfuric acid is equivalent to 56.10 mg. of KOH. Each cc. difference between the number of cc. of normal sulfuric acid consumed in the methyl orange titration and the phenolphthalein titration is equivalent to 138.2 mg. of K_2CO_3.

Packaging and storage—Preserve Potassium Hydroxide in tight containers.

Potassium Iodide

POTASSIUM IODIDE

Potassii Iodidum

Pot. Iodid.

KI Mol. wt. 166.02

Potassium Iodide, when dried at 110° for 4 hours, contains not less than 99 per cent of KI.

Description—Potassium Iodide occurs as hexahedral crystals, either transparent and colorless or somewhat opaque and white, or as a white, granular powder. It is stable in dry air, but slightly deliquescent in moist air. Its solutions are neutral or slightly alkaline to litmus paper.

Solubility—One Gm. of Potassium Iodide dissolves in 0.7 cc. of water, in 22 cc. of alcohol, and in 2 cc. of glycerin. One Gm. of it dissolves in 0.5 cc. of boiling water.

Identification—A solution of Potassium Iodide responds to the tests for *Potassium*, page 657, and for *Iodide*, page 661.

Loss on drying—Dry Potassium Iodide at 110° for 4 hours: the loss in weight does not exceed 1 per cent.

Free alkali—Dissolve 1 Gm. of Potassium Iodide in 10 cc. of water, and add 0.1 cc. of tenth-normal sulfuric acid: no color is produced by the subsequent addition of a drop of phenolphthalein T.S.

Iodate, nitrite, thiosulfate, and barium—Dissolve 500 mg. of Potassium Iodide in 10 cc. of water, which has been previously boiled and cooled, and add 2 drops of diluted sulfuric acid: no distinct yellow color appears within 30 seconds, and no turbidity develops in 1 minute.

Nitrate, nitrite, and ammonia—Add 5 cc. of sodium hydroxide T.S. and about 200 mg. of aluminum wire to a solution of 1 Gm. of Potassium Iodide in 5 cc. of water

contained in a test tube of about 40-cc. capacity. Insert a pledget of purified cotton in the upper portion of the test tube, and place a piece of moistened red litmus paper over the mouth of the tube. Heat the test tube and its contents on a water bath for 15 minutes: no blue coloration of the paper is discernible.

Heavy metals—Dissolve 2 Gm. of Potassium Iodide in 20 cc. of water, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Potassium Iodide is 10 parts per million.

Assay—Dry about 500 mg. of Potassium Iodide at 110° for 4 hours, weigh accurately, dissolve it in about 10 cc. of water, and add 35 cc. of hydrochloric acid and 5 cc. of chloroform. Titrate with twentieth-molar potassium iodate until the purple color of iodine disappears from the chloroform. Add the last portions of the iodate solution, dropwise, agitating vigorously and continuously. After the chloroform has been decolorized, allow the mixture to stand for 5 minutes. If the chloroform develops a purple color, titrate further with the iodate solution. Each cc. of twentieth-molar potassium iodate is equivalent to 16.60 mg. of KI.

Packaging and storage—Preserve Potassium Iodide in well-closed containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Potassium Permanganate

POTASSIUM PERMANGANATE

Potassii Permanganas

Pot. Permang.

$KMnO_4$ Mol. wt. 158.03

Potassium Permanganate, when dried over sulfuric acid for 18 hours, contains not less than 99 per cent of $KMnO_4$.

Caution—Great care should be observed in handling Potassium Permanganate, as dangerous explosions are liable to occur if it is brought into contact with organic or other readily oxidizable substances, either in solution or in the dry condition.

Description—Potassium Permanganate occurs as dark purple crystals, almost opaque by transmitted light and of a blue metallic luster by reflected light. The color is sometimes modified by a dark bronze-like appearance. It is stable in air.

Solubility—One Gm. of Potassium Permanganate dissolves in 15 cc. of water, and in 3.5 cc. of boiling water.

Identification—A solution of Potassium Permanganate is deep violet red when concentrated, and rose color when highly diluted, and responds to the tests for *Permanganate*, page 662.

Loss on drying—When dried over sulfuric acid for 18 hours, Potassium Permanganate loses not more than 0.5 per cent of its weight.

Assay—Dry about 500 mg. of Potassium Permanganate over sulfuric acid for 18 hours, then weigh accurately 100 to 120 mg., and dissolve it in 25 cc. of water. Mix the solution with 2 cc. of sulfuric acid, previously diluted cautiously with 5 cc.

of water, and 50 cc. of tenth-normal oxalic acid, warm the mixture to about 80°, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal oxalic acid is equivalent to 3.161 mg. of $KMnO_4$.

Packaging and storage—Preserve Potassium Permanganate in well-closed containers.

POTASSIUM SODIUM TARTRATE

Potassii Sodii Tartras

Pot. Sod. Tart.—Rochelle Salt

KOOC. CHOH. CHOH. COONa.

$KNaC_4H_4O_6.4H_2O$ **Mol. wt. 282.23**

Potassium Sodium Tartrate, when rendered anhydrous by drying at 150°, contains not less than 99 per cent of $KNaC_4H_4O_6$.

Description—Potassium Sodium Tartrate occurs as colorless crystals, or as a white, crystalline powder, having a cooling, saline taste. As it effloresces slightly in warm, dry air, the crystals are often coated with a white powder.

Solubility—One Gm. of Potassium Sodium Tartrate dissolves in 1 cc. of water. It is practically insoluble in alcohol.

Identification—

A: When ignited, Potassium Sodium Tartrate emits the odor of burning sugar, and leaves a residue which is alkaline to litmus paper and which effervesces with acids.

B: To 10 cc. of a solution of Potassium Sodium Tartrate (1 in 20) add 10 cc. of acetic acid: a white, crystalline precipitate is produced within 15 minutes.

C: A solution of Potassium Sodium Tartrate (1 in 10) responds to the tests for *Tartrate*, page 663.

Loss on drying—Weigh accurately about 3 Gm. of Potassium Sodium Tartrate, and dry gradually at first and then to constant weight at 150°: the loss in weight is not less than 21 per cent and not more than 26 per cent.

Free alkali—A solution of Potassium Sodium Tartrate (1 in 20) is alkaline to litmus paper, but the color of a 10-cc. portion of this solution is not affected by the addition of 1 drop of phenolphthalein T.S.

Ammonia—Heat a 5-cc. portion of solution of Potassium Sodium Tartrate (1 in 10) with sodium hydroxide T.S.: the odor of ammonia is not noticeable.

Heavy metals—Dissolve 2 Gm. of Potassium Sodium Tartrate in a mixture of 20 cc. of water and 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Potassium Sodium Tartrate is 10 parts per million.

Assay—Weigh accurately about 2 Gm. of the dried Potassium Sodium Tartrate obtained in the determination of *Loss on drying*, and proceed as directed under *Alkali Salts of Organic Acids*, page 617. Each cc. of half-normal sulfuric acid is equivalent to 52.54 mg. of $KNaC_4H_4O_6$.

Packaging and storage—Preserve Potassium Sodium Tartrate in tight containers.

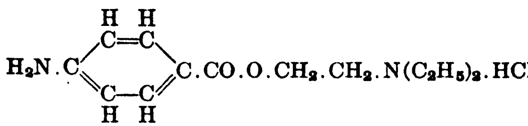
AVERAGE DOSE—**10 Gm.** (approximately 2½ drachms).

Procaine Hydrochloride

PROCAINE HYDROCHLORIDE

Procainæ Hydrochloridum

Procain. Hydrochlor.—Procaine



$C_{13}H_{20}N_2O_2.HCl$ Mol. wt. 272.77

Description—Procaine Hydrochloride occurs as small, white crystals, or as a white, crystalline powder. It is odorless and is stable in air. Procaine Hydrochloride exhibits local anesthetic properties when placed on the tongue.

Solubility—One Gm. of Procaine Hydrochloride dissolves in 1 cc. of water and in 30 cc. of alcohol. It is slightly soluble in chloroform, and almost insoluble in ether.

Melting range—Procaine Hydrochloride melts between 153° and 156°, page 667.

Identification—

A: Separate portions of a solution of Procaine Hydrochloride (1 in 10) yield precipitates with gold chloride T.S., iodine T.S., mercuric-potassium iodide T.S., and with trinitrophenol T.S.

B: A solution of Procaine Hydrochloride (1 in 10) remains unchanged upon the addition of a solution of sodium bicarbonate (1 in 20), but with sodium hydroxide T.S. or sodium carbonate T.S. it yields a colorless, oily precipitate which becomes crystalline on standing.

C: Dissolve 100 mg. of Procaine Hydrochloride in 5 cc. of water, add 2 drops each of hydrochloric acid and a solution of sodium nitrite (1 in 10), and then a solution of 200 mg. of betanaphthol in a mixture of 3 cc. of sodium hydroxide T.S. and 7 cc. of water: a scarlet red precipitate is produced (phenacaine yields a yellow precipitate).

D: Procaine Hydrochloride responds to the tests for *Chloride*, page 659.

Difference from cocaine—To a solution of 100 mg. of Procaine Hydrochloride in 5 cc. of water add 3 drops of diluted sulfuric acid, followed by 5 drops of potassium permanganate T.S.: the violet color of the latter is immediately discharged.

Free acid—A solution of 1 Gm. of Procaine Hydrochloride in 25 cc. of water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried over sulfuric acid for 4 hours, Procaine Hydrochloride loses not more than 1 per cent of its weight.

Residue on ignition—Procaine Hydrochloride yields not more than 0.15 per cent of residue on ignition, page 685.

Heavy metals—Dissolve 1 Gm. of Procaine Hydrochloride in 15 cc. of water, add 1 cc. of normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Procaine Hydrochloride is 20 parts per million.

Readily carbonizable substances—Dissolve 500 mg. of Procaine Hydrochloride in

5 cc. of sulfuric acid: the solution has no more color than matching fluid G, page 680.

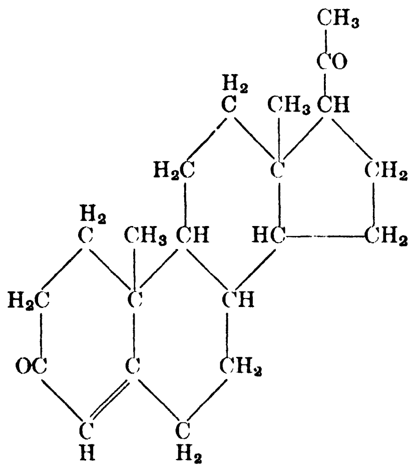
Packaging and storage—Preserve Procaine Hydrochloride in well-closed, light-resistant containers.

Progesterone

PROGESTERONE

Progesteronum

Progest.



$C_{21}H_{30}O_2$ Mol. wt. 314.45

Description—Progesterone occurs as a white, crystalline powder. It is colorless and is stable in air.

Solubility—Progesterone is practically insoluble in water; it is soluble in alcohol, in acetone, and in dioxane. It is sparingly soluble in vegetable oils.

Melting range—Progesterone exists in two polymorphic modifications; the α-form melts between 127° and 131°, the β-form melts at about 121°.

Specific rotation—The specific rotation, $[\alpha_D^{20^\circ}]$, of Progesterone, determined in a solution of dioxane, containing in each 10 cc. 200 mg. of Progesterone, previously dried over sulfuric acid for 4 hours, and using a 100-mm. tube, is not less than +172° and not more than +182°.

Identification—Dissolve 6.5 mg. of Progesterone in 1.5 cc. of alcohol containing an excess of hydroxylamine hydrochloride and 1 drop of glacial acetic acid, and reflux the mixture for 2 hours; evaporate to about 1 cc., and add 2 cc. of water: progesterone dioxime separates in leaf-shaped aggregates. Recrystallize the progesterone

dioxime from diluted alcohol: the crystals, dried at 100°, melt between 236° and 240°.

Packaging and storage—Preserve Progesterone in tight, light-resistant containers.

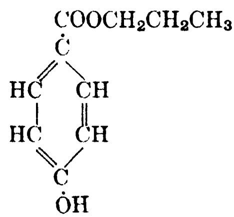
AVERAGE DOSE—Intramuscular, 5 mg. (approximately 1/12 grain).

Propylparaben

PROPYLPARABEN

Propylparabenum

Propylparaben.—Propyl Parahydroxybenzoate



$C_{10}H_{12}O_3$ Mol. wt. 180.20

Propylparaben, when dried at 60° for 2 hours, contains not less than 99 per cent of $C_{10}H_{12}O_3$.

Description—Propylparaben occurs as small, colorless crystals, or as a white powder

Solubility—One Gm. of Propylparaben is soluble in about 2000 cc. of water. It is soluble in alcohol, in ether, and in acetone.

Melting range—Propylparaben melts between 95° and 98°, page 667.

Identification—Dissolve about 500 mg. of Propylparaben in 10 cc. of sodium hydroxide T.S., and boil for 30 minutes, allowing the solution to evaporate to a volume of about 5 cc. Cool the mixture, and carefully acidify with diluted sulfuric acid. Collect the precipitate on a filter when cool, wash it several times with small portions of water, and dry in a desiccator over sulfuric acid: the melting point of the liberated *p*-hydroxybenzoic acid is between 212° and 215°, page 667.

Residue on ignition—Propylparaben yields not more than 0.05 per cent of residue on ignition, page 685.

Free acid—Heat 500 mg. of Propylparaben in 10 cc. of water to 80°, cool, and filter: the filtrate is neutral or only slightly acid to litmus paper.

Chloride—Heat 2 Gm. of Propylparaben with 100 cc. of water, cool, add water to restore the original volume, and filter through cotton. To 50 cc. of the filtrate add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S.: no more turbidity is produced than in a control test using 0.5 cc. of fiftieth-normal hydrochloric acid.

Sulfate—To 10 cc. of the filtrate obtained in the test for *Chloride* add a few drops of diluted hydrochloric acid and a few drops of barium chloride T.S.: no turbidity is produced within 10 minutes.

Assay—Place about 2 Gm. of Propylparaben, previously dried at 60° for 2 hours and accurately weighed, in a flask, add 40 cc. of normal sodium hydroxide, rinse the sides of the flask with water. Cover with a watch glass, boil gently for 1 hour, and cool. Add 5 drops of bromothymol blue T.S., and titrate the excess of sodium hydroxide with normal sulfuric acid to match the color of a buffer solution of pH 6.5 containing the same amount of indicator. The buffer solution contains 25 cc. of fifth-molar potassium biphosphate and 15.2 cc. of tenth-normal sodium hydroxide diluted to 100 cc. Determine the normality of the normal sodium hydroxide in the same manner as in the test. Each cc. of normal sodium hydroxide is equivalent to 180.20 mg. of $C_{10}H_{12}O_3$.

Packaging and storage—Preserve Propylparaben in tight containers.

PYROXYLIN

Pyroxylinum

Pyroxylin.—Soluble Guncotton

Pyroxylin is a product obtained by the action of a mixture of nitric and sulfuric acids on cotton, and consists chiefly of cellulose tetranitrate $[C_{12}H_{16}O_6(NO_3)_4]$.

Description—Pyroxylin occurs as a yellowish white, matted mass of filaments, resembling raw cotton in appearance, but harsh to the touch. *It is exceedingly inflammable*, burning, when unconfined, very rapidly and with a luminous flame. When kept in well-closed bottles and exposed to light, it is decomposed with the evolution of nitrous vapors, leaving a carbonaceous residue.

Solubility—Pyroxylin dissolves slowly but completely in 25 parts of a mixture of 3 volumes of ether and 1 volume of alcohol. It is soluble in acetone and in glacial acetic acid, and is precipitated from these solutions by water.

Residue on ignition—Saturate about 500 mg. of Pyroxylin, accurately weighed, with alcohol in a dish placed in cold water, and ignite the Pyroxylin at the top. When combustion is complete, heat the dish to redness, and cool: not more than 0.3 per cent of residue remains.

Acid and water-soluble substances—Stir 1 Gm. of Pyroxylin with 20 cc. of water for 10 minutes, and filter: the filtrate does not have an acid reaction. Evaporate 10 cc. of the filtrate to dryness on a water bath: not more than 1.5 mg. of residue remains.

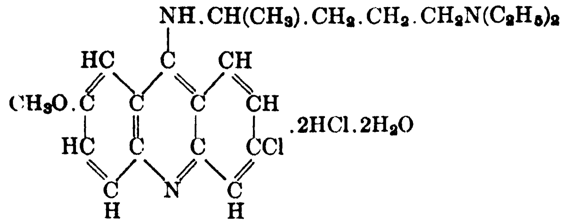
Packaging and storage—Preserve Pyroxylin loosely packed in cartons.

Quinacrine Hydrochloride

QUINACRINE HYDROCHLORIDE

Quinacrinæ Hydrochloridum

Quinacrin. Hydrochlor.—Mepacrine Hydrochloride



$C_{23}H_{30}ClN_3O.2HCl.2H_2O$ Mol. wt. 508.91

Quinacrine Hydrochloride contains not less than 77 per cent and not more than 80.2 per cent of quinacrine base, $C_{23}H_{30}ClN_3O$, corresponding to not less than 98 per cent of $C_{23}H_{30}ClN_3O.2HCl.2H_2O$.

Description—Quinacrine Hydrochloride is a bright yellow, crystalline powder. It is odorless and has a bitter taste.

Solubility—One Gm. of Quinacrine Hydrochloride dissolves in about 35 cc. of water. It is soluble in alcohol.

Identification—

A: To 5 cc. of a solution of Quinacrine Hydrochloride (1 in 40), add a slight excess of ammonia T.S.: a yellow to orange, oily precipitate is formed which adheres to the wall of the vessel and is soluble in ether.

B: To 5 cc. of a solution of Quinacrine Hydrochloride (1 in 40), add 1 cc. of diluted nitric acid: a yellow, crystalline precipitate is formed.

C: To 5 cc. of a solution of Quinacrine Hydrochloride (1 in 40), add 1 cc. of mercury bichloride T.S.: a yellow precipitate is formed.

D: The filtrate from the precipitate, obtained in *Identification test A*, when acidified with nitric acid, responds to the identity tests for *Chloride*, page 659.

Loss on drying—When dried at 100° for 4 hours, Quinacrine Hydrochloride loses not less than 6 per cent and not more than 8 per cent of its weight.

Residue on ignition—The residue on ignition of 200 mg. of Quinacrine Hydrochloride is negligible, page 685.

pH—A solution of Quinacrine Hydrochloride (1 in 100) has a pH of about 4.5.

Assay—Transfer about 250 mg. of Quinacrine Hydrochloride, accurately weighed, to a 100-cc. volumetric flask, and add 10 cc. of water and 10 cc. of a solution prepared by dissolving 25 Gm. of sodium acetate and 10 cc. of glacial acetic acid in enough water to make 100 cc. of solution. Add 50 cc. of tenth-normal potassium dichromate and enough water to make the mixture measure 100 cc. Stopper the flask, mix the contents thoroughly, then filter through a dry filter paper, rejecting the first 15 cc. of the filtrate. Measure 50 cc. of the subsequent filtrate into a glass-stoppered flask, and add 15 cc. of hydrochloric acid and 20 cc. of potassium iodide T.S. Stopper the flask, mix the contents by swirling gently, and allow the mixture to stand in the dark for 5 minutes. Dilute with 75 cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. as the indicator when the end-point is neared. Perform a blank test with the same quantities of the same reagents and in the same manner. and make any necessary correction. Each cc. of tenth-normal potassium dichromate is equivalent to 6.666 mg. of $C_{23}H_{30}ClN_3O$.

Packaging and storage—Preserve Quinacrine Hydrochloride in tight, light-resistant containers.

AVERAGE DOSE—0.1 Gm. (approximately $1\frac{1}{2}$ grains).

QUINACRINE HYDROCHLORIDE TABLETS

Tabellæ Quinacrinæ Hydrochloridi

Tab. Quinacrin. Hydrochlor.

Quinacrine Hydrochloride Tablets contain not less than 95 per cent and not more than 110 per cent of the labeled amount of $C_{23}H_{30}ClN_3O.$-$2HCl.2H_2O$.

Identification—

A: Powder a sufficient number of the tablets to yield about 250 mg. of quinacrine hydrochloride, and extract with two 15-cc. portions of hot water, filtering after each extraction. To 5 cc. of the extract add ammonia T.S., and remove the oily precipitate by extraction with two 10-cc. portions of ether. The water layer, acidified with nitric acid, responds to the tests for *Chloride*, page 659.

B: Add to the remaining portion of the water extract 2 cc. of ammonia T.S.: a yellow, oily precipitate forms. Shake the mixture with several 10-cc. portions of chloroform until the water layer is practically colorless. Evaporate the chloroform solution on a steam bath in a small beaker, and add to the residue 3 cc. of hot water and 2 cc. of diluted hydrochloric acid, moistening the sides of the beaker with the liquid and stirring with a glass rod. Allow to stand for $\frac{1}{2}$ hour, then filter, and wash with ice-cold water until the washings are practically neutral to litmus, and dry at about 100°: the crystals respond to *Identification tests A, B,* and *C*, under *Quinacrine Hydrochloride*, page 434.

Assay—Weigh a counted number of not less than 20 Quinacrine Hydrochloride Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 250 mg. of quinacrine hydrochloride, place it in a separatory funnel with 25 cc. of water and 3 cc. of diluted hydrochloric acid. Extract the suspension with two 15-cc. portions of chloroform. Wash the chloroform extracts in a second separatory funnel with 10 cc. of water. Discard the washed chloroform, and add the water in the second separatory funnel to the suspension of tablet material. Make the suspension alkaline with ammonia T.S., and extract completely with successive, 20-cc. portions of chloroform until the last chloroform extract is colorless. Filter the combined chloroform extracts through purified cotton moistened with chloroform, wash the cotton with a few cc. of chloroform, gently evaporate the filtrate to dryness, and heat the residue at 100° for 15 minutes. Add to the residue 2 cc. of glacial acetic acid, mix well, and warm on a steam bath until the quinacrine base has dissolved. Transfer the residue completely with the aid of 75 cc. of warm water to a 200-cc. volumetric flask, cool, and add 10 cc. of a solution prepared by dissolving 25 Gm. of sodium acetate and 10 cc. of glacial acetic acid in sufficient water to make 100 cc. Then add 50 cc. of tenth-normal potassium dichromate and water to make 200 cc., and mix well. Filter through a dry filter into a dry flask, rejecting the first 15 cc. of the filtrate. Measure 100 cc. of the subsequent filtrate into a glass-stoppered flask, add 15 cc. of hydrochloric acid and 20 cc. of potassium iodide T.S., stopper the flask, and allow to stand in the dark for 5 minutes. Dilute with 75 cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate,

using starch T.S. as the indicator when the end-point is neared. Perform a blank with the same quantities of potassium iodide, hydrochloric acid and water, and make any necessary correction. Each cc. of tenth-normal potassium dichromate is equivalent to 8.482 mg. of $C_{23}H_{30}ClN_3O.2HCl.2H_2O$.

Packaging and storage—Preserve Quinacrine Hydrochloride Tablets in tight containers.

Sizes—Quinacrine Hydrochloride Tablets usually available contain the following amounts of quinacrine hydrochloride: 50 and 100 mg. (¾ and 1½ grains).

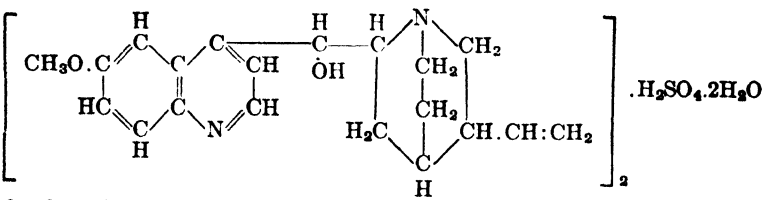
AVERAGE DOSE OF QUINACRINE HYDROCHLORIDE—0.1 Gm. (approximately 1½ grains).

Quinidine Sulfate

QUINIDINE SULFATE

Quinidinæ Sulfas

Quinidin. Sulf.



$(C_{20}H_{24}N_2O_2)_2.H_2SO_4.2H_2O$ Mol. wt. 782.92

Quinidine Sulfate is the sulfate of an alkaloid obtained from various species of *Cinchona* and their hybrids and from *Remijia pedunculata* Flückiger (Fam. *Rubiaceæ*), or prepared from quinine.

Description—Quinidine Sulfate occurs as fine, needle-like, white crystals, frequently cohering in masses. It is odorless, has a very bitter taste, and darkens on exposure to light. Its solutions are neutral or slightly alkaline to litmus paper.

Solubility—One Gm. of Quinidine Sulfate dissolves in about 100 cc. of water, and in about 10 cc. of alcohol. One Gm. of it dissolves in 15 cc. of boiling water. It is soluble in chloroform, but almost insoluble in ether.

Identification—

A: A solution of Quinidine Sulfate acidified with diluted sulfuric acid exhibits a vivid blue fluorescence.

B: A solution of Quinidine Sulfate is dextrorotatory (*quinine sulfate is lævorotatory*).

C: Add 1 or 2 drops of bromine T.S. to 5 cc. of a solution of Quinidine Sulfate (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

D: To 5 cc. of a solution of Quinidine Sulfate (1 in 100) add 1 cc. of silver nitrate T.S., and stir the mixture with a glass rod: a white precipitate appears after a short interval (difference from *many other alkaloids*).

E: Quinidine Sulfate responds to the tests for *Sulfate*, page 709.

Loss on drying—When dried to constant weight at 120°, Quinidine Sulfate loses not more than 5 per cent of its weight.

Residue on ignition—Quinidine Sulfate yields not more than 0.1 per cent of residue on ignition, page 685.
Inorganic salts—Proceed as directed for the test for *Inorganic Salts* under *Quinine Sulfate*, page 442. The weight of the residue does not exceed 2 mg.
Readily carbonizable substances—Dissolve 200 mg. of Quinidine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 680.
Other cinchona alkaloids—Dissolve 500 mg. of Quinidine Sulfate in 15 cc. of boiling water, and add a solution of 500 mg. of potassium iodide in 5 cc. of water, which, if necessary, has previously been neutralized to litmus paper with tenth-normal sulfuric acid: a white precipitate appears. Mix well, cool the mixture to 15°, and keep it at this temperature for 1 hour with frequent agitation. Filter, and add 2 drops of ammonia T.S. to the filtrate: no turbidity is produced within 1 minute.
Packaging and storage—Preserve Quinidine Sulfate in well-closed, light-resistant containers.
Labeling—Label Quinidine Sulfate to indicate whether the product was obtained from natural sources or was produced from quinine.

AVERAGE DOSE—**0.2 Gm.** (approximately 3 grains).

Quinidine Sulfate Tablets

QUINIDINE SULFATE TABLETS

Tabellæ Quinidinæ Sulfatis

Tab. Quinidin. Sulf.

Quinidine Sulfate Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $(C_{20}H_{24}N_2O_2)_2.H_2SO_4.2H_2O$.

Identification—
A: Dissolve the residue from the *Assay* by warming with 1 cc. of diluted sulfuric acid and 5 cc. of water, and dilute with water to make 10 cc.: the resulting solution has a vivid blue fluorescence and is dextrorotatory.
B: One cc. of the solution obtained in test *A*, when diluted with 5 cc. of water, responds to *Identification test C* under *Quinidine Sulfate*, page 436.
C: A filtered solution of Quinidine Sulfate Tablets responds to the tests for *Sulfate*, page 709.

Assay—Weigh a counted number of not less than 20 Quinidine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered Tablets, equivalent to about 400 mg. of quinidine sulfate, and transfer it completely to a 100-cc. volumetric flask. Add 50 cc. of water and 5 cc. of diluted sulfuric acid, agitate well, and allow the mixture to stand over night. Add sufficient water to make exactly 100 cc., mix well, and filter through an asbestos pad in a Gooch crucible or through a sintered glass crucible. Transfer 50 cc. of the clear filtrate to a separator, render it distinctly alkaline with ammonia T.S., and extract the alkaloid with successive portions of chloroform, using 25 cc., 10 cc., 10 cc., and 10 cc., or more if necessary until the alkaloid is completely extracted. Wash the combined chloroform extract with 5 cc. of water, then filter the chloroform solution through a filter paper moistened with chloroform, and wash the separator and the filter with several 5-cc. portions of chloroform. Evaporate the combined chloroform extracts in a tared vessel on a steam bath, with the aid of a current of air, to about 2 cc., then add 10 cc. of alcohol, evaporate to dryness, and dry at 100° to constant weight. The weight of the quinidine so obtained, multiplied by 1.207, represents the equivalent of $(C_{20}H_{24}N_2O_2)_2.H_2SO_4.2H_2O$.

Packaging and storage—Preserve Quinidine Sulfate Tablets in well-closed containers.
Labeling—The label of the container of Quinidine Sulfate Tablets must indicate whether the quinidine was obtained from natural sources or produced from quinine.
Sizes—Quinidine Sulfate Tablets usually available contain the following amounts of quinidine sulfate: 100, 200, and 300 mg. (1½, 3, and 5 grains).

AVERAGE DOSE OF QUINIDINE SULFATE—0.2 Gm. (approximately 3 grains).

Quinine and Urethane Injection

QUININE AND URETHANE INJECTION

Injectio Quininæ et Urethani

Inj. Quin. et Ureth.—Quinine Hydrochloride and Ethyl Carbamate Injection U. S. P. XII

Quinine and Urethane Injection is a sterile solution in water for injection of approximately two parts of quinine hydrochloride and one part of urethane. It contains not less than 95 per cent and not more than 105 per cent of the labeled amount of quinine hydrochloride ($C_{20}H_{24}N_2O_2.HCl.2H_2O$) and of urethane ($C_3H_7O_2N$). It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Quinine and Urethane Injection preferably by Process F or Process E at a temperature not exceeding 65°. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—

A: The residue obtained in the *Assay for quinine hydrochloride*, when dissolved in diluted sulfuric acid, shows a vivid blue fluorescence, and the solution responds to *Identification test B* under *Quinine Hydrochloride*, page 441.

B: The Injection responds to the test for *Chloride*, page 659.

Assay for quinine hydrochloride—Dilute the volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 630, with water to an exact volume, and mix well. Transfer an accurately measured volume of the dilution, equivalent to about 500 mg. of quinine hydrochloride, to a separator, render distinctly alkaline with ammonia T.S., and extract the alkaloid completely by shaking with successive portions of chloroform until 0.5 cc. of the water layer, when slightly acidified with hydrochloric acid, gives no reaction with mercuric potassium iodide T.S. Wash the combined chloroform extract with two 5-cc. portions of water, filter the chloroform through a filter paper moistened with chloroform into a tared flask or beaker, and wash the separator and the filter with several small portions of chloroform. Evaporate the combined chloroform solutions nearly to dryness on a steam bath, dissolve the residue in 10 cc. of ether, evaporate to dryness on a steam bath, and dry to constant weight at 100°. The weight of the anhydrous quinine so obtained, multiplied by 1.2236, represents the equivalent weight of $C_{20}H_{24}N_2O_2.HCl.2H_2O$.

Assay for urethane—Transfer an accurately measured volume of the dilution prepared in the *Assay for quinine hydrochloride*, equivalent to about 150 mg. of ure-

thane, to a 500-cc. Kjeldahl flask, and dilute with water to about 30 cc. Add carefully 20 cc. of sulfuric acid, and boil gently under a reflux condenser for 3 hours. Cool thoroughly, cautiously dilute with 150 cc. of water, and again cool. Connect the flask with a trap condenser and with a receiver containing exactly 25 cc. of tenth-normal sulfuric acid. Make the contents of the flask strongly alkaline with sodium hydroxide (use about 100 cc. of 30 per cent solution), and distil until the distillate measures about 175 cc., then titrate the excess of acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 8.909 mg. of $C_3H_7O_2N$.

Packaging and storage—Preserve Quinine and Urethane Injection preferably in single-dose, hermetic containers, or in other suitable containers. See *Containers for Injections*, page 630.

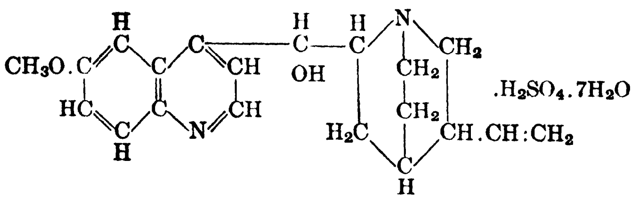
Sizes—Quinine and Urethane Injection usually available contains the following amounts of quinine hydrochloride and of urethane: quinine hydrochloride—250 mg. (4 grains) and urethane—120 mg. (2 grains) in 2 cc.

Quinine Bisulfate

QUININE BISULFATE

Quininæ Bisulfas

Quin. Bisulf.—Quinine Acid Sulfate



$C_{20}H_{24}N_2O_2.H_2SO_4.7H_2O$ Mol. wt. 548.60

The bisulfate of an alkaloid usually obtained from cinchona.

Description—Quinine Bisulfate occurs as white or colorless crystals, usually needle-like, or as a white, crystalline powder. It is odorless, and has a very bitter taste. It effloresces on exposure to dry air, and turns yellow on exposure to light. Its solutions are strongly acid to litmus paper.

Solubility—One Gm. of Quinine Bisulfate dissolves in 10 cc. of water, in 25 cc. of alcohol, in about 15 cc. of glycerin, and in about 625 cc. of chloroform. One Gm. of it dissolves in 1 cc. of boiling water and in 1 cc. of boiling alcohol.

Identification—

A: A solution of Quinine Bisulfate (1 in 20) has a blue fluorescence.

B: A solution of Quinine Bisulfate is strongly lævorotatory.

C: Add 1 or 2 drops of bromine T.S. to 5 cc. of a solution of Quinine Bisulfate (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

D: Quinine Bisulfate responds to the tests for *Sulfate*, page 663.

Loss on drying—When dried at 100° to constant weight, Quinine Bisulfate loses not more than 24 per cent of its weight.

Residue on ignition—Quinine Bisulfate yields not more than 0.05 per cent of residue on ignition, page 685.

Ammonium salts—Heat 300 mg. of Quinine Bisulfate with 3 cc. of sodium hydroxide T.S. on a water bath: the mixture does not at once evolve the odor of ammonia.

Readily carbonizable substances—Dissolve 200 mg. of Quinine Bisulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 680.

Other cinchona alkaloids—Dissolve 2.52 Gm. of Quinine Bisulfate in a mixture of 20 cc. of alcohol and 50 cc. of hot water, and neutralize the solution with normal sodium hydroxide, using 2 drops of methyl red T.S. as the indicator. Evaporate the solution to dryness on a water bath, powder the residue, mix it in a test tube with 20 cc. of water, and agitate the mixture at 65° for 30 minutes. Cool the mixture to 15°, and allow it to stand at this temperature for 2 hours with occasional shaking, then filter it through a filter paper having a diameter of from 8 to 10 cm. Transfer 5 cc. of this filtrate, at a temperature of 15°, to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S., previously cooled to 15°, and added all at once: a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3.

Packaging and storage—Preserve Quinine Bisulfate in tight, light-resistant containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

Quinine Dihydrochloride

QUININE DIHYDROCHLORIDE

Quininæ Dihydrochloridum

Quin. Dihydrochlor.

$C_{20}H_{24}N_2O_2.2HCl$ Mol. wt. 397.34

The dihydrochloride of an alkaloid usually obtained from cinchona.

Description—Quinine Dihydrochloride occurs as a white, odorless powder, having a very bitter taste. It is affected by light. Its solutions are strongly acid to litmus paper.

Solubility—One Gm. of Quinine Dihydrochloride dissolves in about 0.6 cc. of water and in about 12 cc. of alcohol. It is slightly soluble in chloroform and very slightly soluble in ether.

Identification—

A: Add 1 or 2 drops of bromine T.S. to 5 cc. of a solution of Quinine Dihydrochloride (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

B: Quinine Dihydrochloride responds to the tests for *Chloride*, page 659.

Loss on drying—When dried at 100° for 3 hours, Quinine Dihydrochloride loses not more than 3 per cent of its weight.

Residue on ignition—Quinine Dihydrochloride yields not more than 0.15 per cent of residue on ignition, page 685.

Sulfate—One Gm. of Quinine Dihydrochloride shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.

Barium—Add a few drops of diluted sulfuric acid to 10 cc. of a solution of Quinine Dihydrochloride (1 in 20): the mixture does not become turbid.

Readily carbonizable substances—Dissolve 200 mg. of Quinine Dihydrochloride in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 680.

Other cinchona alkaloids—Dissolve 1.8 Gm. of Quinine Dihydrochloride in 10 cc. of water, add a slight excess of ammonia T.S., extract the mixture successively with 20, 10, and 10 cc. of chloroform, and evaporate the combined chloroform solutions to dryness on a water bath. Dissolve the residue in 25 cc. of alcohol, dilute the solution with 50 cc. of hot water, add normal sulfuric acid (about 5 cc.) to render the solution acid, using 2 drops of methyl red T.S. as the indicator, and neutralize

the excess of acid with normal sodium hydroxide. Evaporate the liquid to dryness on a water bath, powder the residue, mix it in a test tube with 20 cc. of water, and agitate the mixture at 65° for 30 minutes. Cool the mixture to 15°, and allow it to stand at this temperature for 2 hours, with occasional shaking, then filter it through a filter paper having a diameter of from 8 to 10 cm. Transfer 5 cc. of this filtrate, at a temperature of 15°, to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S., previously cooled to 15° and added all at once: a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3.

Packaging and storage—Preserve Quinine Dihydrochloride in well-closed, light-resistant containers.

AVERAGE DOSE—1 Gm. (approximately 15 grains).

Quinine Hydrochloride

QUININE HYDROCHLORIDE

Quininæ Hydrochloridum

Quin. Hydrochlor.

$C_{20}H_{24}N_2O_2.HCl.2H_2O$ Mol. wt. 396.91

The hydrochloride of an alkaloid usually obtained from cinchona.

Description—Quinine Hydrochloride occurs as white, silky, glistening needles. It is odorless, has a very bitter taste, and effloresces when exposed to warm air. Its solutions are neutral or slightly alkaline to litmus paper.

Solubility—One Gm. of Quinine Hydrochloride dissolves in 16 cc. of water, in 1 cc. of alcohol, in about 7 cc. of glycerin, in about 1 cc. of chloroform, and in about 350 cc. of ether. One Gm. dissolves in about 0.5 cc. of boiling water.

Identification—

A: Solutions of Quinine Hydrochloride are not fluorescent, except when highly diluted, or upon the addition of diluted sulfuric acid.

B: Add 1 or 2 drops of bromine T.S. to 5 cc. of a solution of Quinine Hydrochloride (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

C: Quinine Hydrochloride responds to the tests for *Chloride*, page 659.

Loss on drying—When dried at 120° for 2 hours, Quinine Hydrochloride loses not more than 10 per cent of its weight.

Residue on ignition—Quinine Hydrochloride yields not more than 0.15 per cent of residue on ignition, page 685.

Sulfate—One Gm. of Quinine Hydrochloride shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.

Inorganic salts—One Gm. of Quinine Hydrochloride dissolves completely in 7 cc. of a mixture of 2 volumes of chloroform and 1 volume of dehydrated alcohol.

Barium—Add 1 cc. of diluted sulfuric acid to 10 cc. of a hot solution of Quinine Hydrochloride (1 in 20): no turbidity is produced.

Readily carbonizable substances—Dissolve 100 mg. of Quinine Hydrochloride in 2 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 680.

Other cinchona alkaloids—Dissolve about 2.5 Gm. of Quinine Hydrochloride in 60 cc. of water in a separator, add 10 cc. of ammonia T.S., extract the mixture successively with 30 cc. and 20 cc. of chloroform, and evaporate the combined chloroform solutions to dryness on a water bath. Dissolve 1.5 Gm. of this residue in 25 cc. of alcohol, dilute the solution with 50 cc. of hot water, add normal sulfuric acid (about 5 cc.) until the solution is acid, using 2 drops of methyl red T.S. as the indicator, and neutralize the excess of acid with normal sodium hydroxide. Evaporate

the solution to dryness on a water bath, powder the residue, mix it in a test tube with 20 cc. of water, and maintain the mixture at 65° for 30 minutes with frequent agitation. Cool the mixture to 15°, allow it to stand at this temperature for 2 hours with occasional shaking, and then filter it through a filter paper of a diameter from 8 to 10 cm. Transfer 5 cc. of the filtrate to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S., previously cooled to 15° and added all at once: a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3.

Packaging and storage—Preserve Quinine Hydrochloride in tight, light-resistant containers.

AVERAGE DOSE—Oral, **0.6 Gm.** (approximately 10 grains).
Intramuscular, **0.2 Gm.** (approximately 3 grains).

Quinine Sulfate

QUININE SULFATE

Quininæ Sulfas

Quin. Sulf.

$(C_{20}H_{24}N_2O_2)_2 . H_2SO_4\ 2H_2O$ Mol. wt. 782.92

The sulfate of an alkaloid usually obtained from cinchona.

Description—Quinine Sulfate occurs as white, fine, needle-like crystals, usually lusterless, making a light and readily compressible mass. It is odorless, and has a persistent, very bitter taste. When exposed to light, Quinine Sulfate acquires a brown tint. A saturated solution is neutral or slightly alkaline to litmus paper.

Solubility—One Gm. of Quinine Sulfate dissolves in 810 cc. of water, and in 120 cc. of alcohol. One Gm. of it dissolves in 35 cc. of water at 100°, and in about 10 cc. of alcohol at 80°. It is slightly soluble in chloroform and in ether, but is freely soluble in a mixture of 2 volumes of chloroform and 1 volume of dehydrated alcohol.

Identification—

A: Acidify a saturated solution of Quinine Sulfate with diluted sulfuric acid: the solution has a vivid blue fluorescence.

B: Add 1 or 2 drops of bromine T.S. to 5 cc. of a solution of Quinine Sulfate (1 in 1000), and follow with 1 cc. of ammonia T.S.: the liquid acquires an emerald green color due to the formation of thalleioquin.

C: A solution of Quinine Sulfate (1 in 50) made with a few drops of hydrochloric acid responds to the tests for *Sulfate*, page 663.

D: A solution of Quinine Sulfate (1 in 50) in normal sulfuric acid is lævorotatory.

Loss on drying—When dried at 100° for 3 hours, Quinine Sulfate loses not more than 5 per cent of its weight.

Residue on ignition—Quinine Sulfate yields not more than 0.05 per cent of residue on ignition, page 685.

Inorganic salts—Warm 2 Gm. of Quinine Sulfate with 15 cc. of a mixture of 2 volumes of chloroform and 1 volume of dehydrated alcohol at 50° for 10 minutes. Filter through a tared fritted glass filter, using gentle suction, wash the filter with five 10-cc. portions of the chloroform-alcohol mixture, dry at 100° for 1 hour, and weigh: the weight of the residue does not exceed 2 mg.

Readily carbonizable substances—Dissolve 200 mg. of Quinine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid M, page 680.

Other cinchona alkaloids—Dry Quinine Sulfate at 50° for 2 hours, and then agitate

1.8 Gm. of the dried salt with 20 cc. of water at 65° for 30 minutes. Cool the mixture to 15°, allow it to stand at this temperature for 2 hours with occasional shaking, and then filter it through a filter paper of a diameter of from 8 to 10 cm. Transfer 5 cc. of the filtrate, at a temperature of 15°, to a test tube, and mix it gently, without shaking, with 6 cc. of ammonia T.S., previously cooled to 15° and added all at once: a clear liquid is produced. The ammonia T.S. must contain not less than 10 per cent and not more than 10.2 per cent of NH_3.

Packaging and storage—Preserve Quinine Sulfate in well-closed, light-resistant containers.

AVERAGE DOSE—**0.6 Gm.** (approximately 10 grains).

QUININE SULFATE TABLETS

Tabellæ Quininæ Sulfatis

Tab. Quin. Sulf.

Quinine Sulfate Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $(C_{20}H_{24}N_2O_2)_2.H_2SO_4.$-$2H_2O$.

Identification—

A: Dissolve the residue obtained in the assay by warming with 1 cc. of diluted sulfuric acid and 5 cc. of water, and dilute with water to make a volume of 10 cc.: the resulting solution exhibits a vivid blue fluorescence and is lævorotatory. One cc. of the solution, diluted with 5 cc. of water, responds to *Identification test B* under *Quinine Sulfate*, page 442.

B: A filtered solution of Quinine Sulfate Tablets made with the aid of a few drops of hydrochloric acid responds to the tests for *Sulfate*, page 663.

Assay—Weigh a counted number of not less than 20 Quinine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered Tablets, equivalent to about 400 mg. of quinine sulfate, and transfer it completely to a 100-cc. volumetric flask. Add 50 cc. of water and 5 cc. of diluted sulfuric acid, agitate well, and allow to stand over night. Add water to make the mixture measure 100 cc., mix well, and filter through an asbestos pad in a Gooch crucible or through a sintered glass crucible. Transfer 50 cc. of the clear solution to a separator, render it distinctly alkaline with ammonia T.S., and extract the alkaloid with successive portions of chloroform, using 25 cc., 10 cc., 10 cc., and 10 cc., or more if necessary, until the alkaloid is completely extracted. Wash the combined chloroform extract with 5 cc. of water, then filter the extract through a filter moistened with chloroform, and wash the separator and the filter with several 5-cc. portions of chloroform. Evaporate the combined chloroform extract in a tared vessel on a steam bath with the aid of a current of air to about 2 cc., then add 10 cc. of alcohol, evaporate to dryness, and dry at 100° to constant weight. The weight of the quinine so obtained, multiplied by 1.207, represents the equivalent of $(C_{20}H_{24}N_2O_2)_2.H_2SO_4.2H_2O$.

Packaging and storage—Preserve Quinine Sulfate Tablets in well-closed containers.

Sizes—Quinine Sulfate Tablets usually available contain the following amounts of quinine sulfate: 0.12, 0.2, and 0.3 Gm. (2, 3, and 5 grains).

AVERAGE DOSE OF QUININE SULFATE—**0.6 Gm.** (approximately 10 grains).

Rabies Vaccine

RABIES VACCINE

Vaccinum Rabies

Vac. Rabies

Rabies Vaccine is an uncontaminated suspension of the attenuated, diluted, dried or dead, fixed virus of rabies. The virus is obtained from the tissue of the central nervous system of an animal suffering from fixed virus rabies infection. Rabies Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Rabies Vaccine is a more or less turbid, white or whitish liquid, nearly odorless, or having an odor due to the presence of a preservative. Rabies Vaccine must come from animals that are healthy except for rabies infection. It must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used). Rabies Vaccine shall be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Rabies Vaccine*, the type of vaccine, the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, the genus of animal employed when other than the rabbit, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Rabies Vaccine at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, the contents of one container, to be repeated at proper intervals.

Red Saunders

RED SAUNDERS

Santalum Rubrum

Santal. Rub.

Red Saunders is the heart-wood of *Pterocarpus santalinus* Linné filius (Fam. *Leguminosæ*).

Description—

Unground Red Saunders—Usually in the form of a coarse powder, of a purplish, moderately reddish orange or reddish brown color, or in dusky red to dark reddish orange chips. It is nearly odorless, and has a slightly astringent taste.

Powdered Red Saunders—Wood-fibers numerous, mostly irregular in outline, with sharply pointed and occasionally forked ends, from 300 to 750 microns in length, walls very thick, porous, orange to yellowish orange, unevenly thickened and strongly lignified, and the lumina filled with a fine, granular content; tracheæ few with simple or bordered pores and filled with orange to yellow, resinous

masses; occasionally fragments showing medullary ray cells in narrow elliptical groups 1 cell wide and from 3 to 6 cells deep; crystal-fibers few with calcium oxalate in the form of monoclinic prisms, from 8 to 20 microns in length. Mounts in chloral hydrate T.S. are of a deep, reddish orange color.

Identification—

A: Add 500 mg. of Red Saunders to 10 cc. of alcohol: the mixture becomes distinctly reddish brown to reddish orange.

B: Add 500 mg. of Red Saunders to 10 cc. of ether: the solution assumes a brown color, and when held in a bright light shows a distinct greenish yellow fluorescence.

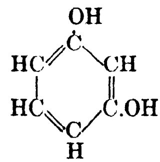
Purity—Add 500 mg. of Red Saunders to 10 cc. of water, agitate, and filter the mixture: the filtrate is colorless to weak yellow.

Resorcinol

RESORCINOL

Resorcinol

Resorcin.—Resorcin



$C_6H_6O_2$ Mol. wt. 110.11

Resorcinol, when dried over sulfuric acid for 4 hours, contains not less than 99.5 per cent of $C_6H_6O_2$.

Description—Resorcinol occurs as white, or nearly white, needle-shaped crystals, or powder. It has a faint, characteristic odor and a sweetish, followed by a bitter taste. It acquires a pink tint on exposure to light and air.

Solubility—One Gm. of Resorcinol dissolves in 1 cc. of water and in about 1 cc. of alcohol. It is freely soluble in glycerin and in ether, and is slightly soluble in chloroform.

Melting range—Resorcinol melts between 109° and 111°, page 667.

Identification—

A: Dissolve 100 mg. of Resorcinol in 2 cc. of sodium hydroxide T.S., add a drop of chloroform, and heat the mixture: an intense crimson color is produced, which changes to pale yellow on the addition of a slight excess of hydrochloric acid.

B: The addition of 3 drops of ferric chloride T.S. to 10 cc. of a solution of Resorcinol (1 in 200) produces a bluish violet color, which becomes brownish yellow on the addition of ammonia T.S.

Acid—A solution of Resorcinol (1 in 20) is neutral or only faintly acid to litmus paper.

Loss on drying—When dried over sulfuric acid for 4 hours, Resorcinol loses not more than 1 per cent of its weight.

Residue on ignition—Resorcinol yields not more than 0.05 per cent of residue on ignition, page 685.

Phenol—A solution of Resorcinol (1 in 20) does not emit the odor of phenol when gently warmed.

Catechol—Add 0.5 cc. of lead acetate T.S. to 10 cc. of a solution of Resorcinol (1 in 20) previously mixed with 2 drops of diluted acetic acid: no turbidity is produced.

Assay—Dissolve about 1.5 Gm. of Resorcinol, previously dried over sulfuric acid for

4 hours and accurately weighed, in sufficient water to make 500 cc. of solution. Transfer 25 cc. of this solution, representing one-twentieth of the weight of Resorcinol taken, to an iodine flask, add 50 cc. of tenth-normal bromine, dilute with 50 cc. of water, add 5 cc. of hydrochloric acid, and at once stopper the flask. Shake the flask, allow it to stand for 1 minute, remove the stopper just sufficiently to introduce quickly 5 cc. of potassium iodide T.S., being careful that no bromine vapor escapes, and at once stopper the flask. Shake the latter thoroughly, remove the stopper, and rinse it and the neck of the flask with 20 cc. of water, being sure that all of the rinsings run into the flask. Titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Determine the normality of the tenth-normal bromine in the same manner as in the test. Each cc. of tenth-normal bromine is equivalent to 1.835 mg. of $C_6H_6O_2$.

Packaging and storage—Preserve Resorcinol in well-closed, light-resistant containers.

Rhubarb

RHUBARB

Rheum

Rhubarb consists of the dried rhizome and roots of *Rheum officinale* Baillon or of *Rheum palmatum* Linné (Fam. *Polygonaceæ*) or of other species (excepting *Rheum Rhaponticum* Linné) or of hybrids of *Rheum*, grown in China and Tibet, deprived of periderm tissues.

Rhubarb yields not less than 30 per cent of diluted alcohol-soluble extractive, pages 710 and 714.

Description—

Unground Rhubarb—In subcylindrical, barrel-shaped or flattened pieces, frequently showing a perforation; from 5 to 17 cm. in length and from 4 to 10 cm. in diameter; outer surface yellowish brown with lighter colored striations and occasional patches of brown cork, more or less covered by a yellowish brown powder; hard; fracture uneven and granular, the fractured surface having a pinkish brown color; the smoothed, transverse surface of the rhizome showing a cambium line near the periphery traversed by radiate medullary rays projecting for a short distance within it; the large area within this circle of medullary rays containing stellate vascular bundles from 2 to 4 mm. in diameter, having an external xylem and internal phloem and radiating, yellowish brown, medullary rays; the stellate bundles being arranged in a more or less continuous circle (*Rheum palmatum*) or scattered irregularly (*Rheum officinale*); odor, aromatic, agreeable; taste, bitter and astringent.

Powdered Rhubarb—Dusky yellowish orange to moderate yellowish brown; rosette aggregates of calcium oxalate frequently exceeding 100 microns in diameter, and occasionally up to 190 microns; starch grains 2 to 25 microns in diameter, spheroidal, single and 2- to 4-compound, with central cleft hilum; fragments of medullary rays, the cells containing an amorphous, yellow substance, insoluble in alcohol but soluble in water and dissolving in ammonia T.S. with a pink color; tracheæ few, non-lignified, reticulate and spiral.

Anthraquinone compounds—Rhubarb becomes red upon the addition of alkalies.

Emodin and chrysophanic acid—Boil 100 mg. of powdered Rhubarb with 10 cc. of a solution of potassium hydroxide (1 in 100), allow it to cool, filter, acidify the filtrate with hydrochloric acid, and shake it with 10 cc. of ether: the ether layer becomes yellow as it stands. Shake this ether solution with 5 cc. of ammonia T.S.: the latter is colored red (*emodin*) and the ether layer remains yellow (*chrysophanic acid*).

European rhubarbs—Unground Rhubarb is firm in texture, not shrunken, and shows more or less definite reticulations upon the outer surface.
Assay—Proceed as directed under *Diluted Alcohol-soluble Extractive*, pages 710 and 714.
Packaging and storage—Preserve Rhubarb against attack by insects, page 9.

Rhubarb Syrup, Aromatic

AROMATIC RHUBARB SYRUP

Syrupus Rhei Aromaticus

Syr. Rhei Arom.

Aromatic Rhubarb Tincture	150 cc.
Potassium Carbonate	1 Gm.
Syrup, a sufficient quantity,	
To make	1000 cc.

Dissolve the potassium carbonate in the tincture, and add to the mixture enough syrup to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 6 to 7 per cent, by volume, of C_2H_5OH.
Packaging and storage Preserve Aromatic Rhubarb Syrup in tight containers, preferably at a temperature not exceeding 25°.

Average dose—10 cc. (approximately 2½ fluidrachms).

Rhubarb Tincture, Aromatic

AROMATIC RHUBARB TINCTURE

Tinctura Rhei Aromatica

Tr. Rhei Arom.

Rhubarb, in moderately coarse powder	200 Gm.
Cinnamon, in moderately coarse powder	40 Gm.
Clove, in moderately coarse powder	40 Gm.
Myristica, in moderately coarse powder	20 Gm.
To make	1000 cc.

Prepare a tincture by Process P, page 708, using a mixture of 100 cc. of glycerin, 500 cc. of alcohol, and 400 cc. of water as the first menstruum, and diluted alcohol as the second menstruum. Macerate the dampened drugs during 4 hours and then percolate rapidly.

Alcohol content—From 43 to 46 per cent, by volume, of C_2H_5OH.

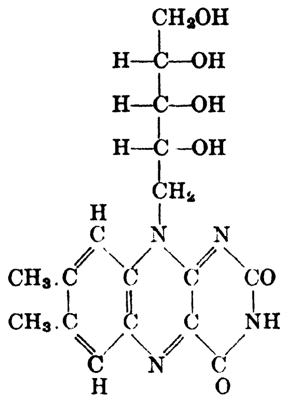
Packaging and storage—Preserve Aromatic Rhubarb Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Riboflavin

RIBOFLAVIN

Riboflavinum

Riboflav.—Lactoflavin, Vitamin B_2, Vitamin G



$C_{17}H_{20}N_4O_6$ Mol. wt. 376.36

Riboflavin, when dried at 100° for 3 hours, contains not less than 98 per cent of $C_{17}H_{20}N_4O_6$.

Description—Riboflavin is a yellow to orange yellow, crystalline powder having a slight odor. It melts at about 280° and its saturated solution is neutral to litmus. When dry, it is not appreciably affected by diffused light, but in solution, especially in the presence of alkalies, it deteriorates quite rapidly, the deterioration being accelerated by light.

Solubility—One Gm. of Riboflavin dissolves in about 10,000 cc. of water, but is more soluble in isotonic solution of sodium chloride. It is less soluble in alcohol, insoluble in ether and in chloroform, but very soluble in dilute alkalies.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Riboflavin is not less than −112° and not more than −122° when determined as follows: Weigh accurately 50 mg. of Riboflavin, previously dried in the dark at 100° for 3 hours, and dissolve it in a mixture of 2 cc. of tenth-normal alcoholic sodium hydroxide and sufficient cold, carbon dioxide-free water to make exactly 10 cc. of solution, and complete the determination of the rotation in a 100-mm. tube within 30 minutes after preparing the solution.

Identification—A solution of 1 mg. of Riboflavin in 100 cc. of water is pale greenish yellow by transmitted light, and has an intense yellowish green fluorescence, which disappears upon the addition of mineral acids or alkalies.

Loss on drying—Dry about 500 mg. of Riboflavin, accurately weighed, at 100° for 3 hours: the loss in weight is not more than 1.5 per cent.

Residue on ignition—Riboflavin yields not more than 0.3 per cent of residue on ignition, page 685.

Lumiflavin—Shake 25 mg. of Riboflavin with 10 cc. of chloroform for 5 minutes, then

filter: the filtrate has no more color than an equal volume of a solution made by diluting 3 cc. of tenth-normal potassium dichromate with sufficient water to make 1000 cc.

Assay—Conduct this assay at all stages so that the solutions are protected from direct sunlight. Weigh accurately from 45 to 55 mg. of the dried Riboflavin obtained in the test for *Loss on drying,* and transfer it completely with the aid of water to a 1000-cc. volumetric flask. Add 5 cc. of acetic acid and sufficient water to make about 800 cc. Heat on a steam bath, protected from light, with frequent agitation until dissolved. Cool to about 25°, dilute to exactly 1000 cc. with water, and mix well. Dilute exactly 10 cc. of this solution with water to exactly 1000 cc. and mix well.

In the same manner prepare a standard solution with U. S. P. Riboflavin Reference Standard, previously dried at 100° for 3 hours, containing 0.5 microgram of the dried U. S. P. Riboflavin Reference Standard per cc., and measure the intensity of its fluorescence in a fluorometer. Immediately after the reading, add to the solution about 10 mg. of sodium hydrosulfite, stirring with a glass rod until dissolved, and at once measure the fluorescence again. The difference between the two readings represents the intensity of the fluorescence derived from riboflavin.

Now measure the intensity of the fluorescence of the final solution prepared from the sample under examination, and correct for any fluorescence derived from foreign substances in the same manner as the standard solution. The corrected fluorescence of the sample corresponds to not less than 98 per cent of the fluorescence of the U. S. P. Riboflavin Reference Standard.

Packaging and storage—Preserve Riboflavin in tight, light-resistant containers.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Riboflavin Injection

RIBOFLAVIN INJECTION

Injectio Riboflavini

Inj. Riboflav.

Riboflavin Injection is a sterile solution of riboflavin in water for injection. It contains not less than 95 per cent and not more than 120 per cent of the labeled amount of $C_{17}H_{20}N_4O_6$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Riboflavin Injection preferably by Process C. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

For the purpose of increasing the solubility of the riboflavin, the Injection may contain nicotinamide, urea, or other suitable, harmless, solubilizing agents.

Fluorometric control—Conduct this test at all stages so that the solutions are protected as far as possible from light. Dilute an accurately measured volume of the injection corresponding to 5 mg. of riboflavin with sufficient water to make 100

cc., and mix well. Dilute exactly 10 cc. of this solution with sufficient water to make 100 cc., and mix well. Proceed as directed in the *Assay* for *Riboflavin*, page 448, beginning with the words "prepare a standard solution." The result corresponds to not less than 95 per cent and not more than 120 per cent of the labeled amount of $C_{17}H_{20}N_4O_6$.

Assay—Dilute an accurately measured volume of the Injection obtained in the *Determination of volume of Injection in Containers*, page 665, with sufficient of a mixture of 3 volumes of tenth-normal hydrochloric acid and 7 volumes of water so that the resulting solution will contain not more than 50 micrograms of riboflavin per cc. Then proceed as described in the *Assay* under *Riboflavin Tablets*, page 450, beginning with the words "Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes."

Labeling—The chemical name of any solubilizer used and the amount present in milligrams per cc. must be declared on the label of the container.

Storage—Preserve Riboflavin Injection preferably in light-resistant, single-dose hermetic containers or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Riboflavin Injection usually available contains the following amounts of riboflavin, with or without solubilizing agents: 0.2 mg. (1/300 grain) in 1 cc.; 1 mg. (1/60 grain) in 2 cc.; 5 mg. (1/12 grain) in 1 cc.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Riboflavin Tablets

RIBOFLAVIN TABLETS

Tabellæ Riboflavini

Tab. Riboflav.

Riboflavin Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of $C_{17}H_{20}N_4O_6$.

Fluorometric control—Conduct this test at all stages so that the solutions are protected as far as possible from light which destroys riboflavin. Weigh a counted number of not less than 20 Riboflavin Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder equivalent to 10.0 mg. of riboflavin, and heat it on a steam bath, protected from light, with a mixture of 500 cc. of water and 1 cc. of acetic acid for 30 minutes. Cool to room temperature, dilute with water to exactly 1000 cc., and mix well. Allow to stand in the dark until any insoluble material, if present, has subsided and the supernatant liquid is clear. If the insoluble matter does not subside, filter the solution, in subdued light, through a sintered glass filter. Dilute exactly 25 cc. of this solution with sufficient water to make exactly 500 cc., and mix well. Proceed as directed in the *Assay* under *Riboflavin*, page 448, beginning with the words "prepare a standard solution." The result corresponds to not less than 95 per cent and not more than 120 per cent of the labeled amount of $C_{17}H_{20}N_4O_6$.

Assay—To a counted number of not less than 10 Riboflavin Tablets in a suitable flask add sufficient tenth-normal hydrochloric acid to make the resulting solution contain not more than 100 micrograms of riboflavin in each cc. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, shake vigorously, cool, add sufficient sodium hydroxide T.S. to produce a pH of 6.8 then sufficient water to make 1000 cc., and filter through filter paper known not to adsorb riboflavin. To an aliquot of suitable size, add water to make a volume such that 100 cc. contains approximately 10 micrograms of riboflavin. Using this as the *Test Solution of the Material to be Assayed*, proceed as directed under the *Riboflavin Assay*, page 685, beginning with the paragraph headed *Standard Riboflavin Solution*.

Packaging and storage—Preserve Riboflavin Tablets in tight, light-resistant containers.

Sizes—Riboflavin Tablets are usually available containing the following amounts of riboflavin: 1 and 5 mg. (1/60 and 1/12 grain).

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Rice Polishings

RICE POLISHINGS

Perpolitiones Oryzæ

Perpol. Oryz.—Rice Bran, Tikitiki

Rice Polishings consist of the fine, flaky pericarp and spermoderm fragments, the embryo, aleurone layer, and outer adhering cells of the starchy endosperm of the grain of *Oryza sativa* Linné (Fam. *Gramineæ*).

Description—Rice Polishings occur as a fine, flaky, yellowish white to pale orange powder with a non-rancid odor and sweetish taste.

Histology—Numerous scale-like fragments of the pericarp consisting of the epicarp with transversely elongated cells having deeply sinuous end walls, the mesocarp of transversely elongated cells, the cross cell layer of vermiform cells, all pressed together and traversed by elongated tube cells; fragments of the spermoderm and perisperm of delicate transversely elongated cells arranged in parallel rows, the former staining yellow, the latter blue with chloro-zinc iodide T.S.; fragments of the aleurone layer of rectangular to polygonal shaped cells containing protein granules and oil globules; fragments of the embryo with small, thin-walled, rectangular and polygonal cells containing protein granules and oil globules; fragments of starchy endosperm of polygonal to radially elongated parenchyma cells containing starch grains; numerous starch grains, simple and in oval or spheroidal aggregates, the individual grains up to 10 microns in diameter; occasional irregular fragments of the hull of pale orange color which, when heated in a 1 per cent solution of sodium hydroxide and mounted, exhibit rows of large, sinuous, thick-walled, siliceous outer epidermal cells of the palet with or without tooth-like projections, sometimes interspersed with short unicellular hairs or their bases.

Rice hull or other foreign matter—Pass Rice Polishings through a standard No. 30 mesh sieve: not more than 10 per cent remains on the sieve.

Rice starch—Add 3 Gm. of Rice Polishings, accurately weighed, to 50 cc. of cold

water, and stir frequently for 1 hour. Filter through a smooth filter paper and wash the residue with 250 cc. of cold water. Transfer the residue to a 250-cc. volumetric flask, add 150 cc. of water and 20 cc. of dilute hydrochloric acid (2 in 3), and heat on a water bath under a reflux condenser for 2½ hours. Cool the mixture, nearly neutralize with sodium hydroxide T.S., add water to make exactly 250 cc., and filter. Place 50 cc. of alkaline cupric tartrate T.S. in a 400-cc. beaker and heat to boiling. Add exactly 25 cc. of the above filtrate, and boil for exactly 2 minutes, keeping the beaker covered. At once collect the cuprous oxide thus formed on a mat of asbestos in a perforated, tared crucible, and wash thoroughly with hot water, then with 10 cc. of alcohol, and finally with 10 cc. of ether. Dry for 30 minutes at 100°, cool in a desiccator, and weigh. The weight of the cuprous oxide does not exceed 240 mg., corresponding to not more than 40 per cent of rice starch.

Identification—Macerate 5 Gm. of Rice Polishings with 10 cc. of water for 15 minutes with frequent stirring. Filter the suspension through gauze, expressing the liquid from the marc, and refilter the liquid through filter paper. To 1 cc. of the filtrate add 2 cc. of diazotized *p*-aminoacetophenone T.S., and allow it to stand 1 hour, then add 5 cc. of isobutyl alcohol, shake well, and permit the isobutyl alcohol to separate from the water layer: the isobutyl alcohol layer is colored pink to purple.

Packaging and storage—Preserve Rice Polishings in well-closed containers and against attack by insects, page 9.

Rice Polishings Extract

RICE POLISHINGS EXTRACT

Extractum Perpolitionum Oryzæ

Ext. Perpol. Oryz.—Tikitiki Extract, Rice Bran Extract, Extracto de Salvado

Rice Polishings Extract contains, in each cc., not less than 20 U. S. P. Units of Vitamin B_1, and represents approximately 14.5 Gm. of rice polishings.

Mix 1000 Gm. of rice polishings with 3000 cc. of a mixture of 3 volumes of alcohol and 1 volume of distilled water, and macerate the mixture with occasional stirring during at least 48 hours. Separate the supernatant liquid, and remove as much liquid from the residue as possible by pressure. Filter the liquid, and evaporate it under vacuum at a temperature not exceeding 60° to a specific gravity of approximately 1.22. Mix this residue with an equal volume of alcohol, and allow to stand over night. Decant the supernatant liquid, and reject the gummy residue. Filter the liquid, and evaporate under vacuum at a temperature not exceeding 60° to an Extract having a specific gravity of approximately 1.32. Heat the Extract to 65°, transfer at once to suitable containers, seal, and then heat for 30 minutes at 65°.

NOTE—Benzoic acid, in an amount not exceeding 0.2 per cent, may be added to this Extract as a preservative.

Description—Rice Polishings Extract is a dark brown, viscous liquid having the odor of burnt sugar and a sweetish taste.
Solubility—Rice Polishings Extract is miscible with cold water, but more readily miscible with warm water.
Specific gravity—The specific gravity of Rice Polishings Extract is between 1.28 and 1.32 at 27.5°.
Identification—To 1 cc. of a solution of Rice Polishings Extract (1 in 10) add 2 cc. of diazotized *p*-amino acetophenone T.S., and let it stand for 1 hour. Add 5 cc. of isobutyl alcohol, shake well, and permit to separate: the isobutyl alcohol layer is colored pink to purple.
Assay for Vitamin B_1—Proceed as directed under *Thiamine Assay, Thiochrome Method*, page 705.
Packaging and storage—Preserve Rice Polishings Extract in tight containers.

AVERAGE DOSE—8 cc. (approximately 2 fluidrachms).

RINGER'S SOLUTION

Liquor Ringeri

Liq. Ring.—Isotonic Solution of Three Chlorides U. S. P. XII

Ringer's Solution contains, in each 100 cc., not less than 820 mg. and not more than 900 mg. of NaCl, not less than 25 mg. and not more than 35 mg. of KCl, and not less than 30 mg. and not more than 36 mg. of $CaCl_2.2H_2O$.

Unless otherwise specified, No. 3—Sterile Ringer's Solution for Parenteral Use must be dispensed.

No. 1—Non-sterile Ringer's Solution

SODIUM CHLORIDE	8.6 Gm.
POTASSIUM CHLORIDE	0.3 Gm.
CALCIUM CHLORIDE	0.33 Gm.
DISTILLED WATER, recently boiled, a sufficient quantity,	
To make	1000 cc.

Dissolve the three salts in a sufficient quantity of recently boiled distilled water to make 1000 cc., and filter until clear.

No. 2—Sterile Ringer's Solution Not for Parenteral Use

Prepare the Solution as directed under No. 1 and sterilize preferably by Process C. See *Sterilization Processes*, page 692. The Solution meets the requirements of the *Sterility Test for Liquids*, page 689.

No. 3—Sterile Ringer's Solution for Parenteral Use

Prepare the Solution as directed under No. 1, replacing the distilled water by water for injection. Place the Solution in suitable containers and sterilize preferably by Process C. See *Sterilization Processes*, page 692. The Solution meets the requirements of the *Sterility Test for Liquids*, page 689, and of the *Pyrogen Test*, page 679. It also conforms to the other requirements given under *Injections*, page 664. Bacteriostatic agents must not be added.

Description—Ringer's Solution is clear and colorless, and has a mild, saline taste.

pH—The pH of Ringer's Solution is from 5 to 7.5.

Arsenic—A 20-cc. portion of Ringer's Solution meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfuric and sulfurous acids (0.1 part per million).

Heavy metals—To 20 cc. of Ringer's Solution add 2 cc. of diluted acetic acid, and dilute with water to 25 cc.: the heavy metals limit (page 657) for Ringer's Solution is 0.3 part per million.

Assay for calcium chloride—Evaporate 50 cc. of Ringer's Solution, accurately measured, to 10 cc., heat to boiling, and make alkaline with ammonia T.S. Add ammonium oxalate T.S., dropwise, until all of the calcium has been precipitated, heat on a water bath for 2 hours, filter through hardened filter paper, and wash thoroughly with warm water. Puncture the filter, and wash the precipitate into a beaker by means of a stream of hot water, followed by 20 cc. of diluted sulfuric acid. Heat to 80°, and titrate with hundredth-normal potassium permanganate. Deduct from the volume of potassium permanganate consumed the volume of the same potassium permanganate required to produce the same end-point in the same volumes of water and diluted sulfuric acid used to dissolve the precipitate. Each cc. of hundredth-normal potassium permanganate is equivalent to 0.735 mg. of $CaCl_2.2H_2O$.

Assay for potassium chloride—To 1.5 cc. of alcohol in a 15-cc. centrifuge tube add 5 cc. of Ringer's Solution, accurately measured, and mix thoroughly. Add dropwise, with continuous shaking, 2 cc. of sodium cobaltinitrite T.S. and allow to stand for 1 hour at room temperature. Centrifuge for 10 minutes at about 2000 r.p.m. or until the precipitate is firmly packed in the bottom of the tube. Decant the supernatant liquid and allow the precipitate to drain for 5 minutes. Wash the precipitate carefully with 5 cc. of 70 per cent alcohol, breaking the bulk of the precipitate by forcing the wash solution in a fine stream from the pipette. Centrifuge for 5 minutes and drain again. Dry the precipitate for 1 hour at 80° to 85° to remove all of the alcohol. Add 10 cc. of fiftieth-normal ceric sulfate and 1 cc. of sulfuric acid, which has been previously diluted with an equal volume of water, and heat on a water bath until all of the precipitate has disappeared. Cool to room temperature and titrate the excess of ceric sulfate with fiftieth-normal ferrous ammonium sulfate, using one drop of ortho-phenanthroline T.S. as the indicator. Each cc. of fiftieth-normal ceric sulfate is equivalent to 0.249 mg. of KCl.

Assay for sodium chloride—Proceed as directed for the *Assay* under *Isotonic Sodium Chloride Solution*, page 490. The sodium chloride content is calculated in the following manner. Multiply the number of mg. in 100 cc. of solution as obtained in the calcium chloride assay by 0.4823 to obtain the amount of chlorine present as cal-

cium chloride. Multiply the number of mg. in 100 cc. as obtained in the potassium chloride assay by 0.4756 to obtain the amount of chlorine present as potassium chloride. Subtract the sum of these two values from the number of mg. in 100 cc. obtained in the assay for total chlorides. Multiply the difference by 1.649 to obtain the number of mg. of NaCl present in 100 cc. of the Solution.

Packaging and storage—Preserve Sterile Ringer's Solution in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Ringer's Solution, Lactated

LACTATED RINGER'S SOLUTION

Liquor Ringeri Lacticus

Liq. Ringer. Lact.

Lactated Ringer's Solution is a sterile solution in water for injection containing, in each 100 cc., not less than 18 mg. and not more than 22 mg. of $CaCl_2.2H_2O$, not less than 27 mg. and not more than 33 mg. of KCl, not less than 570 mg. and not more than 630 mg. of NaCl, and not less than 290 mg. and not more than 330 mg. of sodium lactate ($NaC_3H_5O_3$). It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Lactated Ringer's Solution preferably by *Process C*. See *Sterilization Processes*, page 692.

Lactated Ringer's Solution is also available in a concentrated form consisting of suitable multiples of the ingredients and quantities mentioned above. Such concentrations, when diluted as directed on the label, meet the requirements of the *Tests* and *Assays* described in this monograph.

Lactated Ringer's Solution meets the other requirements given under *Injections*, page 664. Bacteriostatic agents must not be added.

Description—Lactated Ringer's Solution is a clear, colorless, or not more than slightly colored liquid.

pH—The pH of Lactated Ringer's Solution is between 6.5 and 7.5.

Arsenic—A 20-cc. portion of Lactated Ringer's Solution meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfuric and sulfurous acids (0.1 part per million).

Heavy metals—To 20 cc. of Lactated Ringer's Solution add 2 cc. of diluted acetic acid, and dilute with water to 25 cc.: the heavy metals limit, page 657, for Lactated Ringer's Solution, is 0.3 part per million.

Pyrogen—Lactated Ringer's Solution meets the requirements of the *Pyrogen Test*, page 679.

Assay for calcium chloride—Proceed as directed in the *Assay for calcium chloride* under *Ringer's Solution*, page 453. Each cc. of hundredth-normal potassium permanganate is equivalent to 0.735 mg. of $CaCl_2.2H_2O$.

Assay for potassium chloride—Proceed as directed in the *Assay for potassium chloride* under *Ringer's Solution*, page 453. Each cc. of fiftieth-normal ceric sulfate is equivalent to 0.249 mg. of KCl.

Assay for sodium chloride—Measure exactly 25 cc. of Lactated Ringer's Solution into a glass-stoppered flask, and dilute with 25 cc. of water. Add 3 cc. of nitric acid, previously diluted with 5 cc. of water, then, while agitating the mixture, slowly add 50 cc. of tenth-normal silver nitrate. Add 3 cc. of nitrobenzene, and shake vigorously for 1 minute, then titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. The sodium chloride content is calculated as described in the *Assay for sodium chloride* under *Ringer's Solution*, page 453.

Assay for sodium lactate—Evaporate 100 cc. of Lactated Ringer's Solution in a platinum dish, and ignite gently until thoroughly charred. Break up the charred mass well with a glass rod, add 25 cc. of water and exactly 25 cc. of tenth-normal sulfuric acid, and heat on a steam bath for 30 minutes, breaking up any lumps with a glass rod during the heating. Filter, wash well with hot water until the washings are neutral to litmus paper, then cool the combined filtrate and washings, and titrate the excess acid with tenth-normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 11.20 mg. of $NaC_3H_5O_3$.

Packaging and storage—Preserve Lactated Ringer's Solution in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Rose Oil

ROSE OIL

Oleum Rosæ

Ol. Ros.—Otto of Rose

Rose Oil is the volatile oil distilled with steam from the fresh flowers of *Rosa gallica* Linné, *Rosa damascena* Miller, *Rosa alba* Linné, and *Rosa centifolia* Linné, and varieties of these species (Fam. *Rosaceæ*).

Description—Rose Oil is a colorless or yellow liquid, having the characteristic odor and taste of rose. At 25° it is a viscous liquid. Upon gradual cooling it changes to a translucent, crystalline mass, which may be easily liquefied by warming.

Solubility—One cc. of Rose Oil mixes with 1 cc. of chloroform without turbidity. Upon the addition of 20 cc. of 90 per cent alcohol to this solution, the resulting liquid is neutral or faintly acid to moistened litmus paper and deposits a crystalline residue upon standing.

Specific gravity—The specific gravity of Rose Oil is not less than 0.848 and not more than 0.863 at 30° compared with water at 15°.

Optical rotation—The optical rotation of Rose Oil is not less than $-1°$ and not more than $-4°$ in a 100-mm. tube, page 675.

Refractive index—The refractive index of Rose Oil is not less than 1.457 and not more than 1.4630 at 30°, page 682.

Packaging and storage—Preserve Rose Oil in well-filled, tight containers.

ROSE WATER

Aqua Rosæ

Aq. Ros.

Stronger Rose Water,
Distilled Water, each, 1 volume.
Mix them immediately before use.

Allowance being made for its dilution, Rose Water conforms to the description of, and meets the requirements of the tests under *Stronger Rose Water*, page 458.
Packaging and storage—Preserve Rose water in tight containers.

ROSE WATER OINTMENT

Unguentum Aquæ Rosæ

Ung. Aq. Ros.

Spermaceti	125	Gm.
White Wax	120	Gm.
Expressed Almond Oil	560	Gm.
Sodium Borate	5	Gm.
Rose Water	50	cc.
Distilled Water	140	cc.
Rose Oil	0.2	cc.
To make about	1000	Gm.

Reduce the spermaceti and the white wax to small pieces, and melt them on a water bath; add the expressed almond oil, and continue heating until the temperature of the mixture is raised to 70°. Dissolve the sodium borate in the distilled water and rose water, warmed to the temperature of the melted wax and fat, and gradually add the warm solution to the melted mixture, stirring rapidly and continuously until it has cooled to about 45°. Then incorporate the rose oil.

Rose Water Ointment must be free from rancidity. If the Ointment has been chilled, warm it slightly before attempting to incorporate other ingredients with it (see page 2).

Packaging and storage—Preserve Rose Water Ointment in collapsible tubes which do not interact physically or chemically with the Ointment so as to alter its quality or purity.

Rose Water, Stronger

STRONGER ROSE WATER

Aqua Rosæ Fortior

Aq. Ros. Fort.

Stronger Rose Water is a saturated solution of the odoriferous principles of the flowers of *Rosa centifolia* Linné (Fam. *Rosaceæ*), prepared by distilling the fresh flowers with water and separating the excess volatile oil from the clear, water portion of the distillate. Its odor is best preserved by allowing a limited access of fresh air to the container.

Description—Stronger Rose Water is nearly colorless and clear, possessing the pleasant odor and taste of fresh rose blossoms. It must be free from empyreuma, mustiness, and fungoid growths.
Reaction—Stronger Rose Water is neutral or only slightly acid to litmus paper.
Residue—Evaporate 100 cc. of the Water on a water bath, and dry the residue to constant weight at 100°: not more than 15 mg. of residue remains.
Heavy metals—Add 2 cc. of diluted acetic acid to 5 cc. of Stronger Rose Water and dilute to 25 cc. with water: the heavy metals limit, page 657, for Stronger Rose Water is 2 parts per million.

Rosemary Oil

ROSEMARY OIL

Oleum Rosmarini

Ol. Rosmar.

Rosemary Oil is the volatile oil distilled with steam from the fresh flowering tops of *Rosmarinus officinalis* Linné (Fam. *Labiatæ*). It yields not less than 1.5 per cent of esters calculated as bornyl acetate ($C_{10}H_{17}$.-$C_2H_3O_2$), and not less than 8 per cent of total borneol ($C_{10}H_{17}OH$), free and as esters.

Description—Rosemary Oil is a colorless or pale yellow liquid, having the characteristic odor of rosemary, and a warm, camphoraceous taste.
Solubility—Rosemary Oil is soluble in 10 volumes of 80 per cent alcohol by volume.
Specific gravity—The specific gravity of Rosemary Oil is not less than 0.894 and not more than 0.912.
Optical rotation—The optical rotation of Rosemary Oil is not more than −5° and not more than +10° in a 100-mm. tube, page 675.
Refractive index—The refractive index of Rosemary Oil is not less than 1.4640 and not more than 1.4760 at 20°, page 682.
Assay for esters—Proceed as directed for the determination of esters under *Peppermint Oil*, page 390, using 10 cc. of Rosemary Oil. The number of cc. of half-normal alcoholic potassium hydroxide consumed in the saponification, multiplied by 0.09814, indicates the number of Gm. of esters, calculated as bornyl acetate, in the Oil taken for the assay.
Assay for total borneol—Proceed as directed for the determination of total menthol

under *Peppermint Oil,* page 390, using 10 cc. of Rosemary Oil. Calculate the per cent of total borneol by the following formula:

$$\text{Per cent of total borneol in the Oil tested} = \frac{A \times 7.712}{B - (A \times 0.021)} \times [1 - (E \times 0.0021)].$$

A is the result obtained by subtracting the number of cc. of half-normal sulfuric acid required in the titration from the number of cc. of half-normal alcoholic potassium hydroxide originally taken, B is the weight of the acetylized oil taken, and E is the percentage of esters calculated as bornyl acetate ($C_{10}H_{17}.C_2H_3O_2$).

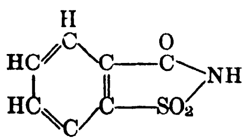
Packaging and storage—Preserve Rosemary Oil in well-filled, tight containers and avoid exposure to excessive heat.

Saccharin

SACCHARIN

Saccharinum

Saccharin.—Gluside, Benzosulfimide



$C_7H_5O_3NS$ Mol. wt. 183.18

Saccharin, when dried at 100° for 3 hours, contains not less than 98.0 per cent of $C_7H_5O_3NS$.

Description—Saccharin occurs as white crystals, or as a white, crystalline powder. It is odorless or has a faint, aromatic odor. Saccharin in dilute solution is from 300 to 500 times as sweet as sucrose. Its solutions are acid to litmus paper.

Solubility—One Gm. of Saccharin dissolves in 290 cc. of water and in 31 cc. of alcohol. One Gm. dissolves in about 25 cc. of boiling water. It is slightly soluble in chloroform and in ether, and is readily dissolved by dilute solutions of ammonia, by solutions of alkali hydroxides, and by solutions of alkali bicarbonates with the evolution of carbon dioxide.

Melting range—Saccharin melts between 226° and 230°, page 667.

Identification—

A: Dissolve about 100 mg. of Saccharin in 5 cc. of a solution of sodium hydroxide (1 in 20), evaporate the solution to dryness, and gently fuse the residue over a small flame until it no longer evolves ammonia. Allow the residue to cool, dissolve it in 20 cc. of water, neutralize the solution with diluted hydrochloric acid, and filter: the addition of a drop of ferric chloride T.S. to the filtrate produces a violet color.

B: Mix 20 mg. of Saccharin with 40 mg. of resorcinol, add 10 drops of sulfuric acid, and heat the mixture over a small flame until it acquires a dark green color. Allow it to cool, add 10 cc. of water, and an excess of sodium hydroxide T.S.: a fluorescent green liquid results.

Loss on drying—When dried at 100° for 3 hours, Saccharin loses not more than 1 per cent of its weight.

Residue on ignition—Saccharin yields not more than 0.2 per cent of residue on ignition, page 685.

Readily carbonizable substances—A solution prepared by dissolving 200 mg. of

Saccharin in 5 cc. of sulfuric acid, and kept at a temperature of from 48° to 50° for 10 minutes, develops no more color than matching fluid A, page 680.

Benzoic and salicylic acids—Add ferric chloride T.S., drop by drop, to 10 cc. of a hot, saturated solution of Saccharin: no precipitate or violet color appears in the liquid.

Heavy metals—Dissolve 2 Gm. of Saccharin in 4 cc. of ammonia T.S., and dilute to 40 cc. with water. Add 1 drop of phenolphthalein T.S., followed by diluted hydrochloric acid until the pink color is just discharged, then add 2 cc. of normal hydrochloric acid, and dilute immediately to 50 cc. with water. Mix well, and rub the inner wall of the vessel with a glass rod until crystallization begins. Allow the solution to stand for 1 hour, then filter through a dry filter, rejecting the first 10 cc. of the filtrate: the heavy metals limit, page 657, for Saccharin, determined in 25 cc. of the subsequent filtrate, is 20 parts per million.

Assay—Accurately weigh about 500 mg. of Saccharin, previously dried at 100° for 3 hours, dissolve it in 75 cc. of hot water, cool quickly, add 3 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide. Each cc. of tenth-normal sodium hydroxide is equivalent to 18.32 mg. of $C_7H_5O_3NS$.

Packaging and storage—Preserve Saccharin in well-closed containers.

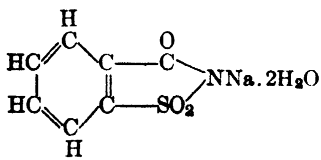
Note—A 60-mg. portion of Saccharin is equivalent in sweetening power to approximately 30 Gm. of sucrose.

Saccharin Sodium

SACCHARIN SODIUM

Saccharinum Sodicum

Saccharin. Sod.—Soluble Saccharin, Soluble Gluside, Sodium Benzosulfimide



$C_7H_4O_3NSNa.2H_2O$ Mol. wt. 241.20

Saccharin Sodium, when dried at 125° for 5 hours, contains not less than 98.0 per cent of anhydrous saccharin sodium ($C_7H_4O_3NSNa$).

Description—Saccharin Sodium occurs as white crystals, or as a white, crystalline powder. It is odorless, or has a faint, aromatic odor, and an intensely sweet taste even in dilute solutions. Saccharin Sodium in dilute solution is from 300 to 500 times as sweet as sucrose. When in powdered form, it usually contains about half the amount of water of hydration due to efflorescence.

Solubility—One Gm. of Saccharin Sodium dissolves in 1.5 cc. of water and in about 50 cc. of alcohol.

Identification—

A: Saccharin Sodium responds to the *Identification tests* under *Saccharin*, page 459.

B: The residue obtained by igniting Saccharin Sodium responds to the test for *Sodium*, page 663.

C: To 10 cc. of a solution of Saccharin Sodium (1 in 10), add 1 cc. of hydrochloric acid: a crystalline precipitate of saccharin is produced, which, when well washed with cold water and dried at 100°, melts between 226° and 230°, page 667.

Free alkali—A solution of Saccharin Sodium (1 in 10) is neutral or only slightly alkaline to litmus paper, and produces no red color with phenolphthalein T.S.

Loss on drying—When dried at 125° for 5 hours, Saccharin Sodium loses not more than 15 per cent of its weight.

Benzoate and salicylate—Add 3 drops of ferric chloride T.S. to 10 cc. of a solution of Saccharin Sodium (1 in 20), previously acidulated with 5 drops of acetic acid: no precipitate or violet color appears in the liquid.

Heavy metals—Dissolve 2 Gm. of Saccharin Sodium in 48 cc. of water, add 2 cc. of normal hydrochloric acid, mix well, and rub the inner wall of the vessel with a glass rod until crystallization begins. Allow the solution to stand for 1 hour, then filter through a dry filter, rejecting the first 10 cc. of filtrate: the heavy metals limit, page 657, for Saccharin Sodium, determined in 25 cc. of the subsequent filtrate, is 20 parts per million.

Readily carbonizable substances—Saccharin Sodium meets the requirement of the test for *Readily carbonizable substances* under *Saccharin*, page 459.

Assay—Weigh accurately 500 mg. to 600 mg. of Saccharin Sodium, previously dried at 125° for 5 hours, and transfer it completely with the aid of 10 cc. of water to a separator. Add 2 cc. of diluted hydrochloric acid and extract the precipitated saccharin first with 30 cc., then with four 20-cc. portions of a solvent composed of 9 volumes of chloroform and 1 volume of alcohol, filtering each extract through a small filter paper moistened with the solvent. Evaporate the combined filtrate to dryness on a steam bath with the aid of a current of air, then dissolve the residue in 75 cc. of hot water, cool, add 3 drops of phenolphthalein, and titrate with tenth-normal sodium hydroxide. Each cc. of tenth-normal sodium hydroxide is equivalent to 20.52 mg. of $C_7H_4O_3NSNa$.

Packaging and storage—Preserve Saccharin Sodium in well-closed containers.

NOTE—A 60-mg. portion of Saccharin Sodium is equivalent in sweetening power to approximately 30 Gm. of sucrose.

Saccharin Sodium Tablets

SACCHARIN SODIUM TABLETS

Tabellæ Saccharini Sodici

Tab. Saccharin. Sod.—Soluble Saccharin Tablets

Saccharin Sodium Tablets contain not less than 95 per cent and not more than 110 per cent of the labeled amount of $C_7H_4O_3NSNa.2H_2O$.

Identification—Dissolve a quantity of Saccharin Sodium Tablets, equivalent to about 1 Gm. of saccharin sodium, in 10 cc. of water, filter if necessary, and add to the solution 5 cc. of diluted hydrochloric acid: a white precipitate of saccharin is formed. Collect the precipitate on a filter, wash it with small portions of cold water until the washings are practically free of chloride, then dry at about 100°. The saccharin so obtained melts between 226° and 230°, page 667, and responds to *Identification tests A* and *B* under *Saccharin*, page 459.

Ammonium salts—Warm a solution of a quantity of powdered Saccharin Sodium Tablets, equivalent to about 300 mg. of saccharin sodium, in 5 cc. of water with 3 cc. of sodium hydroxide T.S.: the odor of ammonia is not noticeable.

Assay—Weigh a counted number of not less than 20 Saccharin Sodium Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 400 mg. of saccharin sodium, and transfer it completely to a 500-cc. Kjeldahl flask with the aid of 40 cc. of water. Add 25 cc. of hydrochloric acid, and boil under a reflux condenser for 1 hour. Cool, dilute

with 100 cc. of water, and connect the flask with a condenser and a receiver containing exactly 40 cc. of tenth-normal sulfuric acid. Add to the flask 100 cc. of 30 per cent sodium hydroxide solution, and distil until about 150 cc. of distillate has been collected. Cool the distillate, if necessary, and titrate the excess acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sulfuric acid is equivalent to 24.12 mg. of $C_7H_4O_3NSNa.2H_2O$.

Packaging and storage—Preserve Saccharin Sodium Tablets in well-closed containers.

Sizes—Saccharin Sodium Tablets usually available contain the following amounts of saccharin sodium: 15, 30, and 60 mg. (¼, ½, and 1 grain).

NOTE—One 60 mg. (approximately 1 grain) Saccharin Sodium Tablet is equivalent in sweetening power to approximately 30 Gm. of sucrose.

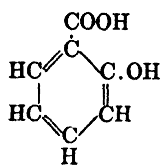
Salicylic Acid

SALICYLIC ACID

Acidum Salicylicum

Acid. Salicyl.—Orthohydroxybenzoic Acid

$C_7H_6O_3$



Mol. wt. 138.12

Salicylic Acid, when dried over sulfuric acid for 3 hours, contains not less than 99.5 per cent of $C_7H_6O_3$.

Description—Salicylic Acid occurs as white crystals, usually in fine needles, or as a fluffy, white, crystalline powder. It has a sweetish, afterward acrid taste, and is stable in air. Synthetic Salicylic Acid is white and odorless. When prepared from natural methyl salicylate, Salicylic Acid may have a slightly yellow or pink tint, and a faint, gaultheria-like odor.

Solubility—One Gm. of Salicylic Acid dissolves in 460 cc. of water, in 3 cc. of alcohol, in 45 cc. of chloroform, in 3 cc. of ether, and in 135 cc. of benzene. One Gm. of the Acid dissolves in about 15 cc. of boiling water.

Melting range—Salicylic Acid melts between 158° and 161°, page 667.

Identification—Salicylic Acid responds to the tests for *Salicylate*, page 663.

Residue on ignition—Salicylic Acid yields not more than 0.05 per cent of residue on ignition, page 685.

Chloride—Heat 1.5 Gm. of Salicylic Acid with 75 cc. of water until the acid is dissolved, cool, add sufficient water to restore the original volume, and filter. A 25-cc. portion of the filtrate shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 25-cc. portion of the filtrate prepared for the test for *Chloride* shows no more *Sulfate* than corresponds to 0.1 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy Metals—Dissolve 1 Gm. of Salicylic Acid in 25 cc. of acetone, add 2 cc. of water and 10 cc. of hydrogen sulfide T.S. Any color produced is not darker than that of a control made with 25 cc. of acetone, 2 cc. of standard lead solution, page 657, and 10 cc. of hydrogen sulfide T.S. (20 parts per million).

Readily carbonizable substances—Dissolve 500 mg. of Salicylic Acid in 5 cc. of sulfuric acid: the solution has no more color than matching fluid C, page 680.

Assay—Dissolve about 500 mg. of Salicylic Acid, previously dried over sulfuric acid for 3 hours and accurately weighed, in 25 cc. of diluted alcohol, which previously has been neutralized with tenth-normal sodium hydroxide, using 3 drops of phenolphthalein T.S. as the indicator. Titrate this solution with tenth-normal sodium hydroxide to a pink color. Each cc. of tenth-normal sodium hydroxide is equivalent to 13.81 mg. of $C_7H_6O_3$.

Packaging and storage—Preserve Salicylic Acid in well-closed containers.

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SARSAPARILLA

Sarsaparilla

Sarsap.

Sarsaparilla is the dried root of *Smilax aristolochiæfolia* Miller, known in commerce as Mexican Sarsaparilla; or of *Smilax Regelii* Killip and Morton, known in commerce as Honduras Sarsaparilla; or of undetermined species of *Smilax*, respectively known in commerce as Ecuadorian and Central American Sarsaparilla (Fam. *Liliaceæ*).

Description—Sarsaparilla is nearly odorless; taste mucilaginous, somewhat sweetish and acrid.

Unground Mexican Sarsaparilla—Roots long, from 3.5 to 6 mm. in diameter, frequently attached to a crown having one or more stout stems; usually shrunken, forming sharp longitudinal ridges and broad furrows; externally light grayish brown or weak reddish brown to yellowish brown; the furrows may contain adhering earth; finely hairy; nearly devoid of branches of fibrous rootlets; fracture of cortex brittle, of central cylinder tough and fibrous; cortex mealy and pale orange or light yellowish brown and horny; woody zone yellow and porous; pith lighter colored and distinct.

Unground Ecuadorian Sarsaparilla—Roots long, from 2 to 6 mm. in diameter, frequently attached to a crown having one or more stout purplish stems; externally reddish brown to purplish, longitudinally wrinkled or furrowed with occasional fibrous rootlets; fracture of cortex short to fibrous, of central cylinder tough and fibrous; cortex brown to reddish brown, woody zone yellowish brown and porous; pith white.

Unground Honduras Sarsaparilla—Roots long, from 2 to 5 mm., rarely 6 mm. in diameter and bound together by roots of the same plant into compact cylindrical bundles from 8 to 15 cm. in diameter; externally reddish brown or dark brown,

longitudinally wrinkled or finely furrowed with occasional fibrous rootlets; fracture short, sometimes tough and fibrous in the central cylinder; internally showing a moderate brown to yellowish orange cortex, a light yellow and porous woody zone and a lighter colored pith.

Unground Central American Sarsaparilla—Roots long, from 1 to 4, rarely 5 mm. in diameter; externally weak reddish brown to moderate yellowish brown, longitudinally wrinkled, occasionally nearly smooth, rarely furrowed and bearing numerous coarse fibrous rootlets; fracture short or tough and fibrous in the central cylinder; internally showing a white to brown cortex, a yellow, porous, woody zone and a lighter colored pith.

Histology—An epidermal layer with basal portions of root hairs; a hypodermis of several layers of strongly lignified cells, the walls being uniformly thickened, except in Mexican and some Ecuadorian Sarsaparilla in which the inner walls are only slightly thickened; a cortex composed of parenchyma cells mostly containing starch; some containing resin or raphides of calcium oxalate, and an endodermis of a single layer of strongly lignified cells, the walls being uniformly thickened except in Mexican and some Ecuadorian Sarsaparilla in which the outer walls are less thickened than the inner and radial walls; a central cylinder composed of a pericambium which in Ecuadorian Sarsaparilla is composed of thick-walled and lignified cells, a poly-arch, radial fibrovascular bundle and a pith of starch-bearing parenchyma cells; tracheæ large, oval in transverse section; the phloem in small strands near the periphery of the bundle.

Powdered Sarsaparilla—Pale brown to weak yellowish orange; starch grains numerous, single or compound, the individual grains from 3 to 23 microns in diameter, spherical, or biconvex or spherical-tetrahedral and frequently with a central, crescentic, 3- to 4-angled, or winged cleft; calcium oxalate in raphides occurring singly or in groups, up to 150 microns in length; cells of the hypodermis and endodermis with reddish orange to yellow, porous walls and in Mexican and Ecuadorian Sarsaparilla showing an uneven or irregular thickening, the cells being from 80 to 500 microns in length; fragments of tracheæ with simple and bordered pores or scalariform or reticulate thickenings, associated with wood fibers having very slightly lignified and porous walls.

Foreign organic matter—The amount of *Foreign organic matter*, other than *rhizome* or *crown portion*, in Sarsaparilla, does not exceed 2 per cent, pages 710 and 711. The amount of *rhizome* and *aerial stem portions* in Mexican and Ecuadorian Sarsaparilla does not exceed 10 per cent.

Acid-insoluble ash—Mexican Sarsaparilla yields not more than 4 per cent of *Acid-insoluble ash*, pages 710 and 711. The other official varieties conform to the standards for *Acid-insoluble ash*, under *Vegetable and Animal Drugs* in the *General Notices*, page 9.

Packaging and storage—Preserve Sarsaparilla against attack by insects, page 9.

Sarsaparilla Fluidextract

SARSAPARILLA FLUIDEXTRACT

Fluidextractum Sarsaparillæ

Fldext. Sarsap.

SARSAPARILLA, in very coarse powder................ 1000 Gm.

Prepare a fluidextract by Process A, page 654, using diluted alcohol as the menstruum. Macerate the drug during 48 hours and percolate at a moderate rate.

Packaging and storage—Preserve Sarsaparilla Fluidextract in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 37 to 42 per cent, by volume, of C_2H_5OH.

Sarsaparilla Syrup, Compound

COMPOUND SARSAPARILLA SYRUP

Syrupus Sarsaparillæ Compositus

Syr. Sarsap. Co.

Sarsaparilla Fluidextract	200 cc.
Glycyrrhiza Fluidextract	15 cc.
Sassafras Oil	0.2 cc.
Anise Oil	0.2 cc.
Methyl Salicylate	0.2 cc.
Alcohol	19.4 cc.
Syrup	765 cc.
To make about	1000 cc.

Mix the fluidextracts and add the alcohol, in which the methyl salicylate and the oils have been dissolved. Gradually add this solution to the syrup, and mix thoroughly.

Alcohol content—From 8.5 to 11 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Compound Sarsaparilla Syrup in tight containers, preferably at a temperature not above 25°.

Sassafras Oil

SASSAFRAS OIL

Oleum Sassafras

Ol. Sassaf.

Sassafras Oil is the volatile oil distilled with steam from the root of *Sassafras albidum* (Nuttall) Nees (Fam. *Lauraceæ*).

Note—If the Oil has solidified in whole or in part, carefully warm it at a low temperature until it is liquefied, then thoroughly mix it before dispensing.

Description—Sassafras Oil is a yellow or reddish yellow liquid, having the characteristic odor and taste of sassafras.
Solubility—Sassafras Oil is soluble in 2 volumes of 90 per cent alcohol.
Specific gravity—The specific gravity of Sassafras Oil is not less than 1.065 and not more than 1.077.
Optical rotation—The optical rotation of Sassafras Oil is not less than +2° and not more than +4° in a 100-mm. tube, page 675.
Refractive index—The refractive index of Sassafras Oil is not less than 1.5250 and not more than 1.5350 at 20°, page 682.
Reaction—A solution of recently distilled Sassafras Oil in 90 per cent alcohol (1 in 2) is neutral to moistened litmus paper.
Heavy metals—Sassafras Oil meets the requirements of the test for *Heavy metals in volatile oils*, page 658.
Packaging and storage—Preserve Sassafras Oil in tight containers.

Scarlet Fever Streptococcus Antitoxin

SCARLET FEVER STREPTOCOCCUS ANTITOXIN

Antitoxinum Scarlatinæ Streptococcicum

Antitox. Scarlat. Streptococ.—Scarlet Fever Antitoxin

Scarlet Fever Streptococcus Antitoxin is a sterile solution of antitoxic substances obtained from the blood serum or plasma of a healthy animal which has been immunized against the toxin produced by the streptococcus regarded as causative of scarlet fever. Scarlet Fever Streptococcus Antitoxin has a potency of not less than 400 antitoxic units per cc. Scarlet Fever Streptococcus Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Scarlet Fever Streptococcus Antitoxin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight, granular deposit. Scarlet Fever Streptococcus Antitoxin is free from harmful substances detectable by animal inoculation, and does not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol if either of these is used), and its total solids must not exceed 20 per cent.
Regulations—The potency of the Antitoxin shall be expressed in antitoxic units and the unit shall be that of the standard Scarlet Fever Antitoxin distributed by the National Institute of Health of the United States Public Health Service.

The outside label must bear the name *Scarlet Fever Streptococcus Antitoxin* and must indicate the minimum number of antitoxin units in the package, the manufacturer's lot number of the Antitoxin, the name, address, and license number of the manufacturer, the genus of animal employed when other than the horse, and

the date beyond which the minimum potency of contents, as declared on the label, may not be maintained.

Packaging and storage—Preserve Scarlet Fever Streptococcus Antitoxin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Diagnostic, for aid in determining the nature of a rash (Schultz-Charlton test) intracutaneous into erythematous eruption, not to exceed 0.2 cc. Parenteral, therapeutic, 6000 units; prophylactic, 2000 units.

Scarlet Fever Streptococcus Toxin

SCARLET FEVER STREPTOCOCCUS TOXIN

Toxinum Scarlatinæ Streptococcicum

Toxin. Scarlat. Streptococ.—Dick Test Toxin

Scarlet Fever Streptococcus Toxin is a sterile solution, in a medium containing not more than 1 per cent of peptone but no meat extractive, of certain products including a soluble toxin, resulting from the growth in the broth of suitable strains of hemolytic streptococci. Scarlet Fever Streptococcus Toxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Scarlet Fever Streptococcus Toxin is a transparent liquid, having the color of the medium in which it is made and having a slight odor which is often altered somewhat by the antiseptic used as a preservative.

Regulations—No horse blood or other foreign blood shall be added to the culture medium used for the preparation of the Toxin. Scarlet Fever Streptococcus Toxin must be free from harmful substances detectable by animal inoculation.

The potency of the Toxin shall be expressed in terms of the skin test dose, which is the smallest quantity of Toxin which, injected intracutaneously, will induce positive reactions in any person susceptible to scarlet fever, and negative reactions in any person immune to scarlet fever.

The outside label must bear the name *Scarlet Fever Streptococcus Toxin*, the manufacturer's lot number of the Toxin, the name, address, and license number of the manufacturer, and the date beyond which the Toxin may not be expected to retain the potency prescribed by governmental authority.

For active immunization: For this purpose the Toxin shall be dispensed in a series of graduated doses of such potency and number that on the average, when the series has been injected hypodermically at proper intervals into a toxin-susceptible individual, that individual will not react positively to one skin test dose of the Test Toxin, injected intracutaneously.

Packaging and storage—Preserve Scarlet Fever Streptococcus Toxin at a temperature

between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

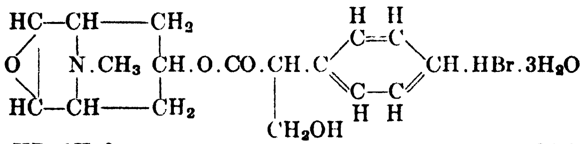
AVERAGE DOSE—Diagnostic, for determining susceptibility (Dick test), intracutaneous, 0.1 cc. of the dilution, representing one skin test dose. Prophylactic injection, for active immunization, graded hypodermic doses to be given at proper intervals until a negative Dick test is obtained.

Scopolamine Hydrobromide

SCOPOLAMINE HYDROBROMIDE

Scopolaminæ Hydrobromidum

Scopol. Hydrobrom.—Hyoscine Hydrobromide



$C_{17}H_{21}NO_4.HBr.3H_2O$ Mol. wt. 438.32

Scopolamine Hydrobromide is the hydrobromide of an alkaloid obtained from plants of the *Solanaceæ*.

Caution—Scopolamine Hydrobromide is extremely poisonous.

Description—Scopolamine Hydrobromide occurs as colorless or white crystals or as a white, granular powder. It is odorless, and is slightly efflorescent in dry air.

Solubility—One Gm. of Scopolamine Hydrobromide dissolves in 1.5 cc. of water and in 20 cc. of alcohol. It is slightly soluble in chloroform, and insoluble in ether.

Melting range—When rendered anhydrous by drying at 100°, Scopolamine Hydrobromide melts between 194° and 197°, the bath being preheated to 180°, page 667.

Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of anhydrous Scopolamine Hydrobromide, determined in a solution containing the equivalent of 5 Gm. of anhydrous Scopolamine Hydrobromide in 100 cc. of solution and using a 100-mm. tube, is not less than −24° and not more than −26°, page 675.

Identification—

A: Add 1 drop of nitric acid to about 1 mg. of Scopolamine Hydrobromide and evaporate to dryness in a small porcelain evaporating dish on a steam bath. To the residue add 3 drops of alcoholic potassium hydroxide T.S., and warm on the steam bath to remove the alcohol: the residue has an intense purple color.

B: Add a few drops of chlorine T.S. to 1 cc. of a solution of Scopolamine Hydrobromide (1 in 20), and shake the mixture with 1 cc. of chloroform: the latter assumes a brownish color.

Free acid—A solution of 500 mg. of Scopolamine Hydrobromide in 15 cc. of water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried at 100° for 4 hours, Scopolamine Hydrobromide loses not more than 13 per cent of its weight.

Residue on ignition—The residue on ignition of 100 mg. of Scopolamine Hydrobromide is negligible, page 685.

Apoatropine—Add 0.05 cc. of tenth-normal potassium permanganate to 15 cc. of a solution of Scopolamine Hydrobromide (1 in 100): the solution is not completely decolorized within 5 minutes.

Other foreign alkaloids—Add a few drops of ammonia T.S. to 1 cc. of a solution of Scopolamine Hydrobromide (1 in 20): the mixture is not turbid. Add potassium hydroxide T.S. to another 1-cc. portion of the solution: the mixture exhibits only a transient whitish turbidity.

Packaging and storage—Preserve Scopolamine Hydrobromide in tight, light-resistant containers.

AVERAGE DOSE—**0.5 mg.** (approximately 1/120 grain).

Senna

SENNA

Senna

Senn.—Senna Leaves

Senna consists of the dried leaflets of *Cassia acutifolia* Delile, known in commerce as Alexandria Senna, or of *Cassia angustifolia* Vahl, known in commerce as Tinnevelly Senna (Fam. *Leguminosæ*).

Description—

Unground Alexandria Senna—Inequilaterally lanceolate or lance-ovate, frequently broken; from 1.5 to 3.5 cm. in length and from 5 to 10 mm. in width, unequal at the base, with very short, stout petiolules; acutely cuspidate, entire, brittle, subcoriaceous; hairs short and somewhat appressed, few on the upper surface, more numerous on the lower surface, where they occur spreading on the midrib, especially on the lower part; color weak yellow to light grayish green to pale olive; odor characteristic; taste mucilaginous, slightly bitter.

Unground Tinnevelly Senna—Usually unbroken, from 2 to 5 cm. in length, from 6 to 15 mm. in width; acute at the apex, slightly hairy; weak yellow to pale olive and otherwise resembling Alexandria Senna.

Histology—Epidermal cells polygonal, with straight walls and frequently containing mucilage; stomata numerous, broadly elliptical, mostly from 20 to 35 microns in length, usually bordered by 2 neighbor-cells with their long axes parallel to that of the stoma, and rarely, though more frequently in Alexandria Senna, a third epidermal cell at the end of the stoma; hairs non-glandular, 1-celled, conical, often curved, with thick papillose walls, from 100 to 350 microns in length; palisade cells in a single layer underlying both surfaces excepting in the midrib region where they occur only beneath the upper epidermis; a meristele occurs in the midrib composed of several radially arranged fibrovascular bundles, the latter separated by narrow medullary rays and supported above and below by arcs of lignified pericyclic fibers; calcium oxalate in rosettes in the spongy parenchyma and in 6- to 8-sided prisms in the crystal-fibers, on the outer surface of each group of pericyclic fibers.

Powdered Senna—Dusky greenish yellow to light olive brown; displaying fragments of veins bearing lignified tracheæ and crystal-fibers, isolated hairs, masses of palisade and spongy parenchyma, fragments of epidermis with stomata, free calcium oxalate rosettes and prisms from 10 to 20 microns in length. In powdered Alexandria Senna the hairs are more numerous than in powdered Tinnevelly Senna.

Identification—Mix 500 mg. of powdered Senna with 10 cc. of an alcohol solution of potassium hydroxide (1 in 10), boil the mixture for about 2 minutes, dilute it with 10 cc. of water, and filter. Acidify the filtrate with hydrochloric acid, shake it with ether, remove the ether layer, and shake it with 5 cc. of ammonia T.S.: the latter is colored orange or bluish red.

Senna stems, pods, or other foreign organic matter—The amount of *senna stems* in Senna does not exceed 8 per cent and the amount of *senna pods* or other *Foreign organic matter* does not exceed 2 per cent, pages 710 and 711.

Acid-insoluble ash—Senna yields not more than 3 per cent of *Acid-insoluble ash*, page 711.

Storage—Preserve Senna against attack by insects, page 9.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

Senna Fluidextract

SENNA FLUIDEXTRACT

Fluidextractum Sennæ

Fldext. Senn.

SENNA, in coarse powder	1000 Gm.

Prepare a fluidextract by Process A, page 654, using a mixture of 1 volume of alcohol and 2 volumes of water as the menstruum. Macerate the drug for 24 hours, then percolate at a moderate rate, and reserve the first 800 cc. of percolate.

Packaging and storage—Preserve Senna Fluidextract in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol content—From 23 to 27 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—**2 cc.** (approximately 30 minims).

Senna Syrup

SENNA SYRUP

Syrupus Sennæ

Syr. Senn.

SENNA FLUIDEXTRACT	250 cc.
CORIANDER OIL	5 cc.
SUCROSE	635 Gm.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Mix the coriander oil with the fluidextract, and gradually add 330 cc. of distilled water. Allow the mixture to stand for 24 hours in a cool place, with occasional agitation, then filter, and pass enough distilled water through the filter to obtain 580 cc. of filtrate. Dissolve the sucrose in this liquid, and add sufficient distilled water to make the product measure 1000 cc. Mix well and strain.

Alcohol content—From 5 to 7 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Senna Syrup in tight containers, preferably at a temperature not above 25°.

AVERAGE DOSE—**8 cc.** (approximately 2 fluidrachms).

Serum, Normal Human

NORMAL HUMAN SERUM

Serum Humanum Normale

Ser. Human. Nor.

Normal Human Serum is the sterile serum obtained by pooling approximately equal amounts of the liquid portion of coagulated whole blood from eight or more humans (*Homo sapiens*) who have been certified by a qualified doctor of medicine as free from any disease which is transmissible by blood transfusion at the time of drawing the blood. Each bleeding is drawn under aseptic precautions into individual sterile centrifuge bottles and allowed to coagulate for at least 12 hours but not more than 24 hours. The cell-free serum is separated by centrifugation, and transferred to a pool by means of a closed system. Sterility tests are made, a preservative is added, the serum is passed through a bacteria-excluding filter and distributed into the final container through a closed system. *Caution*—Each lot of Serum shall be aged in the liquid state for at least 28 days at 2° to 10° subsequent to the removal of the clot and prior to its use as liquid serum, or prior to freezing and drying. Normal Human Serum must be free from harmful substances detectable by animal inoculation, and must not contain an excessive amount of preservative. Normal Human Serum complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Normal Human Serum is available as a liquid serum or in a dried condition.

Liquid serum—Freshly collected Normal Human Serum is a slightly opalescent liquid of a faint yellowish or amber color, and practically odorless in the absence

of a preservative possessing an odor. A slight, granular deposit or increased opalescence may develop on standing.

Dried serum—This is made from liquid Normal Human Serum, after aging for at least 28 days. It contains not more than 1 per cent moisture as determined by exposing 1 or 2 Gm. of the sample, evenly distributed, in a weighing bottle not less than 60 mm. in diameter in a vacuum desiccator at less than 1 mm. pressure over fresh phosphorus pentoxide at room temperature until the weight remains constant to the third decimal. It has a light yellow to deep cream color, is microscopically of a honeycomb-like structure and shows no evidence of fusion.

Regulations—The outside label must bear the name *Normal Human Serum* and indicate the volume of original Normal Human Serum represented in the container, the manufacturer's lot number of the Serum, the name, address, and the license number of the manufacturer, and the date beyond which the quality of the contents may not be maintained.

Packaging and storage—Preserve the liquid Serum at a temperature between 2° and 10°. Dried Serum must not be exposed to excessive heat. Normal Human Serum must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Intravenous, 500 cc.

Sesame Oil

SESAME OIL

Oleum Sesami

Ol. Sesam.

Sesame Oil is the fixed oil obtained from the seed of one or more cultivated varieties of *Sesamum indicum* Linné (Fam. *Pedaliaceæ*).

Description—Sesame Oil is a pale yellow, oily liquid. It is almost odorless, and has a bland taste.

Solubility—Sesame Oil is slightly soluble in alcohol, and is miscible with ether, chloroform, petroleum benzin, or carbon disulfide.

Specific gravity—The specific gravity of Sesame Oil is between 0.916 and 0.921.

Identification—Shake 1 cc. of Sesame Oil for half a minute with a solution of 100 mg. of sucrose in 10 cc. of hydrochloric acid: the acid layer becomes pink and changes to red on standing (*difference from most other fixed oils*).

Free fatty acid—The free acid in 10 Gm. of Sesame Oil requires for neutralization not more than 1 cc. of tenth-normal sodium hydroxide, page 646.

Cottonseed oil—Mix 5 cc. of Sesame Oil in a test tube with 5 cc. of a mixture of equal volumes of amyl alcohol and a solution of sulfur in carbon disulfide (1 in 100), and warm the mixture carefully until the carbon disulfide is expelled, immerse the tube to one-third of its depth in a boiling, saturated solution of sodium chloride: no reddish color develops in 15 minutes.

Saponification value—The saponification value of Sesame Oil is not less than 188 and not more than 193, page 647.

Iodine value—The iodine value of Sesame Oil is not less than 103 and not more than 115, page 647.

Packaging and storage—Preserve Sesame Oil in tight containers.

Siliceous Earth, Purified

PURIFIED SILICEOUS EARTH

Terra Silicea Purificata

Ter. Sil. Purif.—Purified Kieselguhr, Purified Infusorial Earth

Purified Siliceous Earth is a form of silica (SiO_2) consisting of the frustules and fragments of diatoms, purified by boiling with diluted hydrochloric acid, washing, and calcining.

Description—Purified Siliceous Earth is an amorphous, very fine, white, light gray or pale buff powder. It is gritty, readily absorbs moisture, and retains about four times its weight of water without becoming fluid.
Solubility—Purified Siliceous Earth is insoluble in water, acids, or in dilute solution of the alkali hydroxides.
Loss on ignition—When ignited, Purified Siliceous Earth loses not more than 10 per cent of its weight.
Acid-soluble substances—Digest 1 Gm. of Purified Siliceous Earth for 15 minutes with 20 cc. of diluted hydrochloric acid at 50°, and filter. To 10 cc. of the filtrate add 0.5 cc. of sulfuric acid, evaporate, and ignite to constant weight: the weight of the residue does not exceed 8 mg.
Organic impurities—Purified Siliceous Earth does not darken appreciably upon ignition.
Carbonate—Add 1 Gm. of Purified Siliceous Earth to 25 cc. of diluted hydrochloric acid: no effervescence occurs.
Sulfate—Boil the mixture obtained in the test for *Carbonate* for 10 minutes, replacing any water lost by evaporation, and filter: the filtrate does not become turbid upon the addition of a few drops of barium chloride T.S.
Water-soluble iron and reaction—Boil 10 Gm. of Purified Siliceous Earth with 50 cc. of water during 10 minutes, replace any water lost by evaporation, and filter: the filtrate is colorless and neutral to litmus paper, and, on the addition of 5 drops of potassium ferrocyanide T.S. to 5 cc. of the filtrate, no blue color is produced.
Packaging and storage—Preserve Purified Siliceous Earth in well-closed containers.

Silk, Surgical

SURGICAL SILK

Chorda Serica Chirurgicalis

Chord. Ser. Chirurg.—Silk Sutures

Surgical Silk consists of the thread prepared from the cocoon filaments of glutinous gum which are secreted or spun by the mulberry silkworm, *Bombyx mori* Linné (Fam. *Bombycidæ*). The strands may be processed to form threads of various diameters by braiding or twisting, or by a combination of both.

Note—Surgical Silk may be sterilized by exposing the strands to saturated steam at 15 pounds pressure (121.5°) for 30 minutes.

Description—Surgical Silk may be white or colored. *White* Surgical Silk consists of degummed silk which has not been subjected to any bleaching process. *Colored* Surgical Silk consists of degummed silk which has been "iron dyed," or dyed with a harmless vegetable dye, or a certified coal tar color. All uncombined dye shall be removed from the material, so that the color of the suture will not bleed into the tissue.

Surgical Silk may consist of pure silk which is capillary, known as Type A, *Untreated* or *Capillary*, or it may consist of pure silk which has been treated to reduce its capillarity, known as Type B, *Treated* or *Non-Capillary*.

Length—Determine the length of Surgical Silk while the strand is laid out smooth, without tension, on a plane surface: the actual length of each strand is not less than 90 per cent of the length stated on the label.

Diameter of Surgical Silk					Tensile Strength of Surgical Silk
Size	Millimeter		Inch		Minimum Tensile Strength of Surgical Silk in Avoirdupois Pounds, on Straight Pull
	Min.	Max.	Min.	Max.	
0000000, 7-0	0.025	0.051	0.001	0.002	0.25
000000, 6-0	0.051	0.102	0.002	0.004	0.5
00000, 5-0	0.102	0.152	0.004	0.006	1
0000, 4-0	0.152	0.203	0.006	0.008	2
000, 3-0	0.203	0.254	0.008	0.010	3
00, 2-0	0.254	0.330	0.010	0.013	5
0, 1-0	0.330	0.406	0.013	0.016	7
1	0.406	0.483	0.016	0.019	10
2	0.483	0.559	0.019	0.022	13
3	0.559	0.635	0.022	0.025	16
4	0.635	0.711	0.025	0.028	20
5	0.711	0.813	0.028	0.032	25
6	0.813	0.914	0.032	0.036	30
7	0.914	1.016	0.036	0.040	35

Diameter—Determine the diameter of Surgical Silk as directed under *Diameter of Sutures*, page 639, the strand being held under a tension equal to one-fourth of the required minimum tensile strength of the size of Silk being tested, without being permitted to untwist. To determine the diameter of Surgical Silk 5 strands shall be tested. A strand is a continuous length of silk in an envelope, tube, skein or spool. The diameter of Surgical Silk shall be determined at three quarterly points in a 24-inch length, namely, at 6, 12, and 18 inches.

In the case of braided Surgical Silk, two measurements shall be made at each point, the measurements being at right angles to each other. The recorded diameter is the average of the diameters determined at right angles on each point on a length of braided silk.

If the length of the strand does not exceed 5 feet, one section is measured, the section being at the approximate center of the strand.

If the length of the strand is greater than 5 feet, but does not exceed 10 feet, two sets of measurements are made, one set at the approximate center of each half of the strand.

If the length of the strand is greater than 10 feet, but does not exceed 90 feet, three sets of measurements are made, one set at the approximate center of each third of the strand.

If the length of the strand is greater than 90 feet, four sets of measurements are made, one set at the approximate center of each fourth of the strand.

The average diameter of the strand being measured is within the tolerances prescribed for the size claimed on the label. The average of the determined minimum diameters of the strands is not less than the mean specified diameter of the next smaller size. The average of the determined maximum diameters is not greater than the mean specified diameter for the next larger size.

Tensile strength—Determine the tensile strength of Surgical Silk by the straight pull test as directed under the *Tensile Strength Determination*, page 699, using the Incline Plane Tester. Expose the Silk for at least 4 hours to an atmosphere having a relative humidity of 65 per cent, ±2 per cent, and a temperature of 21°, ±1.1° (70° F., ±2° F.), and determine the tensile strength in this atmosphere. The minimum tensile strength of the various sizes of Surgical Silk, determined on the average strength of at least 5 strands from any one lot, and making at least 2 breaks on each strand, meets the requirements of the above table. If the labeled length of the strand is not less than 25 yards, take 2 yards from each of 5 strands selected at random from the lot, rejecting the first 12 inches, and make at least 2 breaks on each strand.

Packaging and storage—Preserve Surgical Silk in well-closed containers.

Labeling—The type, construction, size, and length of Surgical Silk shall be stated on the package.

Silk, Surgical, Sterile

STERILE SURGICAL SILK

Chorda Serica Chirurgicalis Sterilis

Chord. Ser. Chirurg. Steril.—Sterile Silk Sutures

Sterile Surgical Silk is Surgical Silk which has been rendered sterile and protected from contamination by suitable packaging.

Description—Sterile Surgical Silk agrees with the *Description* and conforms to the requirements for *Length* and *Diameter* under *Surgical Silk*, page 473.

Tensile strength—Sterile Surgical Silk, when packaged dry, conforms to the requirements for *Tensile strength* under *Surgical Silk*, page 473. Sterile Surgical Silk that has been packaged in a tubing fluid has a tensile strength, determined immediately after removal from the tubing fluid and without drying, not less than 80 per cent of that required for the same size of *Surgical Silk*, page 473.

Sterility—Sterile Surgical Silk meets the *Sterility Tests for Solids*, page 689.

Packaging and storage—Preserve Sterile Surgical Silk in hermetically sealed glass tubes or in other containers holding not more than 2 strands, and which will maintain the sterility of the Silk until the container is opened for use. The Silk may be packaged in a suitable tubing fluid. Unless hermetically sealed in glass tubes, the containers of Sterile Surgical Silk must be grouped in a second protective container. Sterile Surgical Silk must be sterilized in the container.

Labeling—Each container of one or more strands of Sterile Surgical Silk, and each package of one or more containers, shall indicate the size and type and also the name of the manufacturer. The package shall also indicate the address of the manufacturer, the lot number identifying the method and time of sterilization of the Silk, and, if a tubing fluid is used, its composition shall be stated on the package.

Silver Nitrate

SILVER NITRATE

Argenti Nitras

Arg. Nitras

$AgNO_3$ Mol. wt. 169.89

Silver Nitrate, when powdered and dried in the dark over sulfuric acid for 4 hours, contains not less than 99.8 per cent of $AgNO_3$.

Description—Silver Nitrate occurs as colorless or white crystals. On exposure to light in the presence of organic matter, Silver Nitrate becomes gray or grayish black.

Solubility—One Gm. of Silver Nitrate dissolves in 0.4 cc. of water and in 30 cc. of alcohol. One Gm. of Silver Nitrate dissolves in slightly more than 0.1 cc. of boiling water, and in about 6.5 cc. of boiling alcohol. It is slightly soluble in ether.

Identification—

A: A solution of Silver Nitrate (1 in 50) responds to the tests for *Silver*, page 663.

B: Mix a solution of Silver Nitrate (1 in 10) in a test tube with a drop of diphenylamine T.S., and then carefully superimpose it upon sulfuric acid: a deep blue color appears at the zone of contact.

Clarity and color of solution and reaction—A solution of Silver Nitrate (1 in 10) is clear and colorless and is neutral to litmus paper.

Copper—A solution of Silver Nitrate (1 in 10) is not colored even faintly blue by the addition of an excess of ammonia T.S.

Assay—Powder about 1 Gm. of Silver Nitrate, and dry it in the dark over sulfuric acid for 4 hours. Weigh accurately about 700 mg. of this dried salt, dissolve it in 50 cc. of water, add 2 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 16.99 mg. of $AgNO_3$.

Packaging and storage—Preserve Silver Nitrate in tight, light-resistant containers.

Silver Nitrate, Toughened

TOUGHENED SILVER NITRATE

Argenti Nitras Induratus

Arg. Nitras Indur.—Moulded Silver Nitrate, Fused Silver Nitrate, Silver Nitrate Pencils, Lunar Caustic

Toughened Silver Nitrate contains not less than 94.5 per cent of $AgNO_3$.

Description—Toughened Silver Nitrate occurs in white, crystalline masses generally moulded as pencils or cones. It breaks with a fibrous fracture. Its solutions are neutral to litmus paper. Toughened Silver Nitrate becomes gray or grayish black on exposure to light.

Solubility—Toughened Silver Nitrate, with the exception of about 5 per cent which is silver chloride, possesses the solubilities described under *Silver Nitrate*, page 663.

Other tests—A filtered solution of Toughened Silver Nitrate (1 in 10) responds to the *Identification* tests and meets the requirements of the test for *Copper* under *Silver Nitrate*, page 663.

Assay—Add about 700 mg. of Toughened Silver Nitrate, accurately weighed, to 50 cc. of water, and when the silver nitrate has dissolved, filter the solution. Thoroughly wash the filter and sediment with water, add 2 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S. to the combined filtrate and washings, and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 16.99 mg. of $AgNO_3$.

Packaging and storage—Preserve Toughened Silver Nitrate in tight, light-resistant containers.

Silver Protein, Mild

MILD SILVER PROTEIN

Argentum Proteinicum Mite

Arg. Prot. Mit.—Mild Protein Silver, Mild Protargin

Mild Silver Protein is silver rendered colloidal by the presence of, or combination with, protein. It contains not less than 19 per cent and not more than 23 per cent of Ag.

Caution—Solutions of Mild Silver Protein should be freshly prepared and should be dispensed in amber-colored bottles.

Description—Mild Silver Protein occurs as dark brown or almost black, shining scales or granules. It is odorless, is frequently hygroscopic, and is affected by light.

Solubility—Mild Silver Protein is freely soluble in water, but almost insoluble in alcohol, in chloroform, and in ether.

Identification—

A: Heat about 100 mg. of Mild Silver Protein in a porcelain crucible until all carbonaceous matter is burned off, warm the residue with 1 cc. of nitric acid, dilute with 10 cc. of water, and add a few drops of hydrochloric acid: a white precipitate is produced which dissolves in ammonia T.S.

B: Ferric chloride T.S. added to a solution of Mild Silver Protein (1 in 100) discharges the dark color and a precipitate is gradually produced.

C: To 10 cc. of a solution of Mild Silver Protein (1 in 100) add a few drops of mercury bichloride T.S.: a white precipitate is formed and the supernatant liquid becomes colorless or nearly so.

Ionic silver: The addition of 2 cc. of a solution of sodium chloride (1 in 100) to 10 cc. of a solution of Mild Silver Protein (1 in 100) produces no turbidity.

Distinction from strong silver protein—Dissolve 1 Gm. of Mild Silver Protein in 10 cc. of water. Add, all at once, 7 Gm. of ammonium sulfate, and stir occasionally for 30 minutes. Filter through quantitative filter paper into a 50-cc. Nessler tube, returning the first portions of the filtrate to the filter, if necessary, to secure a clear filtrate, and allow the filter and precipitate to drain. Add to the clear filtrate 25 cc. of a solution of acacia (1 in 100). In a second 50-cc. Nessler tube dissolve 7 Gm. of ammonium sulfate in 10 cc. of water, and add to this solution 25 cc. of the solution of acacia and 1.6 cc. of hundredth-normal silver nitrate. To each tube add 2 cc. of nitric acid, 2 cc. of diluted hydrochloric acid, and enough of the acacia solution to make the volume of each solution 50 cc. Mix the contents of each tube thoroughly, and allow to stand for 5 minutes: the turbidity of the mixture containing the Mild Silver Protein is no greater than that to which no Mild Silver Protein has been added. (Strong silver protein yields a much greater turbidity than the control.)

Assay—Ignite about 2 Gm. of Mild Silver Protein, accurately weighed, in a porcelain crucible until all of the carbon is burned off. Transfer as much as possible of the residue to a beaker, add to the crucible 5 cc. of nitric acid, warm to dissolve any

adhering silver, and transfer the solution to the beaker with the aid of a little water. Cover the beaker, and heat on a water bath until all of the silver is dissolved, adding a little more nitric acid, if necessary. Filter into an Erlenmeyer flask, wash the insoluble residue thoroughly with water, cool, and dilute with water, if necessary, to about 75 cc. Add 2 cc. of ferric ammonium sulfate T.S., and titrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal ammonium thiocyanate is equivalent to 10.79 mg. of Ag.

Packaging and storage—Preserve Mild Silver Protein in tight, light-resistant containers.

Smallpox Vaccine

SMALLPOX VACCINE

Vaccinum Variolæ

Vac. Variol.

Smallpox Vaccine consists of a glycerinated suspension of the vesicles of vaccinia or cowpox which have been obtained from healthy vaccinated animals of the bovine family. The vesicles must be removed and the vaccine must be prepared under aseptic conditions.

The vesicles must be removed from the animal at the time of suitable development, thoroughly triturated and made into a smooth suspension with a water solution of glycerin. This solution must not be acid to bromocresol purple pH indicator and not distinctly alkaline to phenol red pH indicator. Smallpox Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Smallpox Vaccine is a grayish, turbid suspension; it may have an odor and a trace of color due to the presence of a preservative.

The following precautions must be observed in licensed establishments:

No Vaccine shall be prepared from any animal having a communicable disease other than vaccinia. Animals used for propagating Smallpox Vaccine must have responded negatively to a tuberculin test and, prior to vaccination, must have evidenced no ill health while in quarantine for at least 7 days under daily veterinary inspection. After the vaccine pulp has been removed from each animal, a necropsy shall be performed, permanent records of which shall be kept. Smallpox Vaccine shall be free from harmful substances detectable by animal inoculation. Each lot of Smallpox Vaccine shall be examined to determine its freedom from undue bacterial content, and a special examination shall be made of each lot to determine the absence of tetanus organisms and other pathogenic anaerobes. Permanent records of these examinations must be kept. The finished product must be placed in sterile containers that comply with the requirements of the law and of the regulations established by the United States Public Health Service.

Regulations—The outside label must bear the name *Smallpox Vaccine*, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental

authority. The label must also bear directions concerning storage of the package at a temperature below 5°.

Packaging and storage—Preserve and dispense Smallpox Vaccine in hermetically sealed, capillary glass tubes.

It must be kept at a very low temperature, preferably below 0°, and never above 5° as it loses potency rapidly at higher, even moderate, temperatures.

HARD SOAP

Sapo Durus

Sapo Dur.—Soap

Hard Soap is a soda soap.

Description—Hard Soap occurs as a white or whitish solid, in the form of bars, hard, yet easily cut when fresh, or as a fine, white or yellowish white powder. It is slowly soluble in water and in alcohol, more readily, however, with the aid of heat. It has a faint odor, free from rancidity. Its solutions are alkaline to indicators.

Loss on drying—Dissolve about 500 mg. of Hard Soap, accurately weighed, in 10 cc. of alcohol, evaporate the solution to dryness in a tared beaker containing 1 Gm. of washed sand which has been previously dried at 110°, and dry the residue to constant weight at 110°: the loss in weight does not exceed 36 per cent for the unpowdered Soap or 10 per cent for the powdered Soap.

Heavy metals—A 10-cc. portion of a solution of Hard Soap (1 in 20) remains unchanged in color upon the addition of ammonium sulfide T.S., and, upon acidifying another portion of 10 cc. of the solution with hydrochloric acid and filtering, the filtrate remains unchanged in color when an equal volume of hydrogen sulfide T.S. is added and the mixture allowed to stand, well stoppered, in a warm place for 30 minutes.

Sodium chloride, carbonate, silica, or other alcohol-insoluble substances—Dissolve about 10 Gm. of Hard Soap, accurately weighed, in 100 cc. of neutralized alcohol, with the aid of heat. Transfer the undissolved residue, if any, to a tared filter which has been dried at 100°, and wash it thoroughly with boiling neutralized alcohol: the weight of the residue, after drying at 100°, does not exceed 1 per cent of the weight of the Soap taken for the test.

Silica or other water-insoluble substances—Thoroughly wash the residue obtained in the determination of *Sodium chloride, etc.*, with water, and dry it for 4 hours at 100°: the weight of the dried residue does not exceed 0.15 per cent of the weight of the Soap taken for the test.

Alkali hydroxides or free fatty acids—Dissolve 2.5 Gm. of Hard Soap in 50 cc. of boiling neutralized alcohol, filter while hot, and wash the filter thoroughly with boiling neutralized alcohol: the filtrate requires for neutralization not more than 0.2 cc. of tenth-normal sulfuric acid or not more than 0.2 cc. of tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator.

Alkali carbonates—Wash the residue left on the filter in the determination of *Alkali hydroxides or free fatty acids* with 50 cc. of boiling water, cool, and titrate the filtrate with tenth-normal sulfuric acid, using methyl orange T.S. as the indicator: not more than 2 cc. of tenth-normal acid is required.

Characteristics of the liberated fatty acids—Dissolve 25 Gm. of Hard Soap in 300 cc. of hot water in a beaker, gradually add 60 cc. of diluted sulfuric acid, and heat on a water bath until the liberated acids form a transparent layer. Cool the mixture, remove the water layer, and wash the acids with several portions of boiling water, cooling after each addition of water until the last washing, after cooling, is neutral to methyl orange T.S. Melt the acids in a small beaker, and allow them to stand in a molten condition until any water which may be present has collected

in the bottom of the beaker. Filter the melted acids through a dry filter paper in a warm oven. The solidification point of the combined fatty acids is not below 18° and not above 23°, page 645, the acid value is not less than 185 and not more than 205, using about 1 Gm. of the combined fatty acids, accurately weighed, page 646, and the iodine value is not less than 83 and not more than 92, page 647.

Packaging and storage—Preserve Hard Soap in well-closed containers.

Soap, Soft, Liniment

SOFT SOAP LINIMENT

Linimentum Saponis Mollis

Lin. Sapon. Moll.—Tincture of Green Soap

MEDICINAL SOFT SOAP	650 Gm.
LAVENDER OIL	20 cc.
ALCOHOL, a sufficient quantity,	
To make	1000 cc.

Mix the lavender oil with 300 cc. of alcohol, dissolve in this the medicinal soft soap by stirring or by agitation, and set the solution aside for 24 hours. Then filter it through paper, adding sufficient alcohol to make the product measure 1000 cc.

Alcohol content—From 28 to 32 per cent, by volume, of C_2H_5OH.

Soap, Soft, Medicinal

MEDICINAL SOFT SOAP

Sapo Mollis Medicinalis

Sapo Moll. Med.—Soft Soap, Green Soap

Medicinal Soft Soap is a potassium soap made by the saponification of vegetable oils, excluding coconut oil and palm kernel oil, without the removal of glycerin. Soft Soap may be prepared extemporaneously in the following manner:

THE VEGETABLE OIL	380 Gm.
OLEIC ACID	20 Gm.
POTASSIUM HYDROXIDE	91.7 Gm.
GLYCERIN	50 cc.
DISTILLED WATER, a sufficient quantity,	(1000–541.7)
To make about	1000 Gm.

Mix the oil and oleic acid, and heat the mixture to about 80°. Dissolve the potassium hydroxide in a mixture of the glycerin and 100 cc. of distilled water, and add the solution, while it is still hot, to the hot oil. Stir the mixture vigorously until an emulsion is formed, using mechanical stirring if desired, then heat the mixture on a hot plate, with constant vigorous stirring, until it becomes homogeneous and a small portion dissolves completely in hot water, producing a clear solution. Add sufficient hot distilled water to make the soap weigh 1000 Gm., and incorporate the water in the soap until it is uniformly distributed and the soap is of the same consistency throughout.

NOTE—The vegetable oil to be used in the formula given above may be corn, cottonseed, linseed, olive, soya bean, or similar oils which have a saponification value, page 647, not greater than 205, and an iodine value, page 647, not less than 80. Since glycerin is added only to accelerate the saponification, it may be omitted if desired.

The quantity of potassium hydroxide given in the formula is based on an alkalinity equivalent to 85 per cent of KOH. If the potassium hydroxide is of any other strength, a proportionately larger or smaller quantity should be taken.

Medicinal Soft Soap complies with the following requirements:

Description—Medicinal Soft Soap occurs as a soft, unctuous, yellowish white to brownish or greenish yellow, transparent to translucent mass. It has a slight, characteristic odor, often suggesting the oil from which it was prepared, and an alkaline taste. Its solution (1 in 20) is alkaline to indicators.

Water—Place about 10 Gm. of Medicinal Soft Soap, quickly weighed to the nearest centigram, in the distilling flask of the apparatus for the *Moisture Method by Toluene Distillation*, pages 710 and 712. The Soap is most conveniently weighed in a boat of metal foil, of a size that will just pass through the neck of the flask. Place 250 cc. of toluene and 10 Gm. of anhydrous barium chloride in the flask, connect the flask through a ground-glass joint to the distilling apparatus, and fill the receiving tube with toluene. Determine the water as directed under *Moisture Method by Toluene Distillation*, page 712, beginning with the words "Heat the toluene in the flask." The volume of water found corresponds to not more than 52 per cent by weight of the Medicinal Soft Soap taken.

Alcohol-insoluble substances—Dissolve about 5 Gm. of Medicinal Soft Soap, accurately weighed, in 100 cc. of hot neutralized alcohol, collect the residue, if any, on a filter, thoroughly wash it with hot neutralized alcohol, and dry for 4 hours at 100°: the weight of the residue does not exceed 3 per cent of the weight of Soap taken.

Free alkali hydroxides—To the combined filtrate and washings obtained in the determination of *Alcohol-insoluble substances*, add 0.5 cc. of phenolphthalein T.S.: a pink color is produced. Titrate the solution with tenth-normal sulfuric acid until the pink color is just discharged: the volume of tenth-normal acid consumed corresponds to not more than 0.25 per cent of KOH. Each cc. of tenth-normal sulfuric acid is equivalent to 5.61 mg. of KOH.

Alkali carbonates—Wash the filter containing the *Alcohol-insoluble substances* with 50 cc. of boiling water, cool, and titrate the filtrate with tenth-normal sulfuric acid, using methyl orange T.S. as the indicator: not more than 0.5 cc. of tenth-normal

sulfuric acid per Gm. of Medicinal Soft Soap originally taken is required for the neutralization.

Unsaponified matter—A solution of Medicinal Soft Soap in hot water (1 in 20) is nearly clear.

Characteristics of the liberated fatty acids—Dissolve about 30 Gm. of Medicinal Soft Soap in 300 cc. of hot water in a beaker, add gradually 60 cc. of diluted sulfuric acid, and heat on a water bath until the liberated acids form a transparent layer. Decant the fatty acids into a separator, and wash them with 50-cc. portions of hot water until the last washing, when cool, is neutral to methyl orange T.S. Transfer the fatty acids to a dry breaker, and allow them to stand in a warm oven until any water which may be present has separated. Then filter the acids through a dry filter in the warm oven. The acid value of the fatty acids is not more than 205, using about 1 Gm. of the fatty acids, accurately weighed, page 646, and the iodine value of the fatty acids is not less than 85, using from 150 to 200 mg. of the acids for the test, page 647.

Packaging and storage—Preserve Medicinal Soft Soap in well-closed containers.

Soda Lime

SODA LIME

Calx Sodica

Calx Sod.

Soda Lime is a mixture of calcium hydroxide with sodium or potassium hydroxide or both, intended for use in metabolism tests, anesthesia, and oxygen therapy.

Soda Lime may contain an indicator which is inert with respect to its reactivity with ether, ethylene, cyclopropane, and nitrous oxide, and which changes color when the absorption capacity of the Soda Lime for carbon dioxide is exhausted.

Description—Soda Lime occurs as white or grayish white granules, or if an indicator has been added, the Soda Lime may have a color.

Size of granules—Screen 100 Gm. of Soda Lime for 5 minutes as directed under *Method for Determining Uniformity of Fineness*, page 651, using a mechanical shaker. It passes completely through a No. 2 standard mesh sieve, and not more than 2 per cent passes through a No. 40 standard mesh sieve. Not more than 7.0 per cent is retained on the coarse mesh sieve and not more than 15.0 per cent passes through the fine mesh sieve designated on the label.

Identification—

A: Place a granule of Soda Lime on a piece of moist red litmus paper: the paper turns blue immediately.

B: A solution of Soda Lime in acetic acid responds to tests for *Calcium*, page 659; it also imparts a yellow color to a non-luminous flame which, when viewed through cobalt glass, may show a violet color.

Loss on drying—Weigh accurately in a tared weighing bottle 9.5 to 10 Gm. of Soda Lime and dry it at 110° for 2 hours: the loss in weight corresponds to not more than 19.0 per cent of the weight of the Soda Lime taken.

Moisture absorption—Place 9.5 to 10 Gm. of Soda Lime in a 50-cc. weighing bottle having a diameter of 50 mm. and a height of 30 mm. Weigh the bottle and contents, then place it in a desiccator over sulfuric acid having a specific gravity of

1.16 (relative humidity 85 per cent), allow the bottle to remain uncovered for 24 hours, and reweigh: the increase in weight corresponds to not more than 7.5 per cent of the weight of the Soda Lime taken.

Hardness—The hardness of Soda Lime is not less than 75, page 656.

Carbon dioxide absorption capacity—Soda Lime absorbs not less than 19 per cent of its weight of carbon dioxide, when determined as directed under *Carbon Dioxide Absorbency of Soda Lime*, page 625.

Packaging and storage—Preserve Soda Lime in tight containers.

Labeling—If an indicator is present, its name and color change must be stated on the label of the container. The label of the container must indicate the mesh of the Soda Lime in terms of standard mesh sieve sizes, page 652.

SODIUM ASCORBATE INJECTION

Injectio Sodii Ascorbatis

Inj. Sod. Ascorb.

Sodium Ascorbate Injection is a sterile solution of sodium ascorbate ($NaC_6H_7O_6$) in water for injection. It contains not less than 95 per cent and not more than 115 per cent of the labeled amount of ascorbic acid ($C_6H_8O_6$). It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Sodium Ascorbate Injection preferably by Process E or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—

A: To a volume of the Injection, equivalent to 20 mg. of ascorbic acid, add 0.5 cc. of tenth-normal hydrochloric acid, then 3 drops of sodium nitroprusside T.S., and follow immediately with 0.5 cc. of tenth-normal sodium hydroxide: a transient blue color is produced.

B: The Injection, when acidified with a solution of trichloroacetic acid (1 in 20), responds to *Identification test C*, under *Ascorbic Acid*, page 52.

C: Sodium Ascorbate Injection responds to the flame test for sodium, page 663.

pH—The pH of Sodium Ascorbate Injection is between 5.6 and 7.0.

Oxalate—Dilute a volume of the Injection, equivalent to 50 mg. of ascorbic acid, with water to 5 cc. Add 0.2 cc. of acetic acid and 0.5 cc. of calcium chloride T.S.: no turbidity is produced in 1 minute.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, equivalent to about 50 mg. of ascorbic acid, to a 100-cc. volumetric flask. Add 20 cc. of extraction solution, dilute with water to the 100-cc. mark, and mix well. To an aliquot, of suitable size to require at least 10 cc. of the standard dichlorophenol-indophenol solution for titration, proceed as directed under *Ascorbic Acid Assay*, page 620.

Packaging and storage—Preserve Sodium Ascorbate Injection in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Labeling—The label must indicate the amount of sodium ascorbate present in terms of ascorbic acid ($C_6H_8O_6$).

Sizes—Sodium Ascorbate Injection usually available contains sodium ascorbate equivalent to the following amounts of ascorbic acid: 0.1 Gm. (1½ grains) in 2 cc.; 0.5 Gm. (7½ grains) in 2 cc.; 0.5 Gm. (7½ grains) in 5 cc.; 0.5 Gm. (7½ grains) in 10 cc.; 1 Gm. (15 grains) in 5 cc.

AVERAGE DOSE OF ASCORBIC ACID—**0.1 Gm.** (approximately 1½ grains).

Sodium Benzoate

SODIUM BENZOATE

Sodii Benzoas

Sod. Benz.

$NaC_7H_5O_2$ **Mol. wt. 144.11**

Sodium Benzoate, when dried at 110° for 4 hours, contains not less than 99 per cent of $NaC_7H_5O_2$.

Description—Sodium Benzoate is a white, odorless, or nearly odorless, granular or crystalline powder. It is stable in air.

Solubility—One Gm. of Sodium Benzoate dissolves in 2 cc. of water, in 75 cc. of alcohol, and in 50 cc. of 90 per cent alcohol.

Identification—

A: When heated, Sodium Benzoate fuses, emitting vapors having a characteristic odor, then chars, and finally leaves a residue of sodium carbonate and carbon.

B: Sodium Benzoate responds to the tests for *Sodium*, page 663, and for *Benzoate*, page 658.

Loss on drying—When dried at 110° for 4 hours, Sodium Benzoate loses not more than 1 per cent of its weight.

Free alkali—Dissolve 2 Gm. of Sodium Benzoate in 20 cc. of hot water, and add 2 drops of phenolphthalein T.S.: the pink color produced, if any, is discharged by the addition of 0.2 cc. of tenth-normal sulfuric acid.

Heavy metals—Dissolve 2 Gm. of Sodium Benzoate in 45 cc. of water, add, dropwise, with vigorous stirring, 5 cc. of diluted hydrochloric acid, and filter. Use 25 cc. of the filtrate for the test: the heavy metals limit, page 657, for Sodium Benzoate is 20 parts per million.

Chlorinated compounds—Dissolve 1 Gm. of Sodium Benzoate in 10 cc. of water in a separator, add 10 cc. of diluted sulfuric acid, and shake out the benzoic acid with two successive, 20-cc. portions of ether. A portion of 500 mg. of the residue of benzoic acid remaining on the evaporation of the ether meets the test for *Chlorinated compounds* under *Benzoic Acid*, page 70.

Assay—Transfer about 1.5 Gm. of Sodium Benzoate, previously dried at 110° for 4 hours and accurately weighed, to a tall beaker or a flask of about 300-cc. capacity, and add 75 cc. of ether and 5 drops of methyl orange T.S. Titrate the mixture with half-normal hydrochloric acid, mixing intimately the water and ether layers by vigorous stirring, until a permanent orange color is produced in the water layer. Each cc. of half-normal hydrochloric acid is equivalent to 72.06 mg. of $NaC_7H_5O_2$.

Packaging and storage—Preserve Sodium Benzoate in well-closed containers.

SODIUM BICARBONATE

Sodii Bicarbonas

Sod. Bicarb.—Baking Soda

$NaHCO_3$ Mol. wt. 84.02

Sodium Bicarbonate, when dried over sulfuric acid for 4 hours, contains not less than 99 per cent of $NaHCO_3$.

Description—Sodium Bicarbonate is a white, crystalline powder. It is stable in dry air, but slowly decomposes in moist air. Its solutions, when freshly prepared with cold water, without shaking, are slightly alkaline to litmus paper. The alkalinity increases as the solutions stand, are agitated or are heated.

Solubility—One Gm. of Sodium Bicarbonate dissolves in 10 cc. of water. It is insoluble in alcohol.

Identification—A solution of Sodium Bicarbonate responds to the tests for *Sodium*, page 663, and for *Bicarbonate*, page 659.

Insoluble substances—Dissolve 1 Gm. of Sodium Bicarbonate in 20 cc. of water at 25°: the resulting solution is complete and clear.

Carbonate—Dissolve 1 Gm. of Sodium Bicarbonate without agitation in 20 cc. of water at a temperature not exceeding 15°, and add 2 cc. of tenth-normal hydrochloric acid and 2 drops of phenolphthalein T.S.: the mixture does not immediately assume a red tint.

Ammonia—Heat about 1 Gm. of Sodium Bicarbonate in a test tube: no odor of ammonia is evolved.

Arsenic—A 500-mg. portion of Sodium Bicarbonate meets the requirements of the test for *Arsenic*, page 618 (4 parts per million).

Heavy metals—Mix 2 Gm. of Sodium Bicarbonate with 5 cc. of water and 9.5 cc. of diluted hydrochloric acid. Heat to boiling and maintain that temperature for 1 minute. Add 1 drop of phenolphthalein T.S. and then enough ammonia T.S., dropwise, to give the solution a faint pink color. Cool, add 2 cc. of diluted acetic acid and dilute with water to 25 cc.: the heavy metals limit, page 657, for Sodium Bicarbonate is 5 parts per million.

Assay—Weigh accurately about 3 Gm. of Sodium Bicarbonate, previously dried over sulfuric acid for 4 hours, mix it with 25 cc. of water, and titrate with normal sulfuric acid, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 84.02 mg. of $NaHCO_3$.

Packaging and storage—Preserve Sodium Bicarbonate in well-closed containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

SODIUM BIPHOSPHATE

Sodii Biphosphas

Sod. Biphos.—Sodium Dihydrogen Phosphate, Monosodium Orthophosphate, Sodium Acid Phosphate

$NaH_2PO_4.H_2O$ Mol. wt. 138.01

Sodium Biphosphate, when dried at 100° to constant weight, contains not less than 98 per cent of NaH_2PO_4.

Description—Sodium Biphosphate occurs as colorless crystals or as a white, crystalline powder. It is odorless and is slightly deliquescent. Its solutions are acid to litmus paper and effervesce with sodium carbonate.
Solubility—Sodium Biphosphate is freely soluble in water but almost insoluble in alcohol.
Identification—A solution of Sodium Biphosphate (1 in 20) responds to the tests for *Sodium*, page 663, and for *Phosphate*, page 662.
Loss on drying—Dry about 2 Gm. of Sodium Biphosphate, accurately weighed, for 1 hour at 60°, then raise the temperature to 100°, and keep it at that temperature until it ceases to lose weight: the loss in weight is not less than 10 per cent and not more than 15 per cent.
Free acid and disodium phosphate—Dissolve 2 Gm. of Sodium Biphosphate in 40 cc. of water, and add 1 drop of methyl orange T.S.: if the solution is pink, it requires the addition of not more than 0.3 cc. of normal sodium hydroxide to change it to yellow; if the solution is yellow, it requires the addition of not more than 0.3 cc. of normal sulfuric acid to render it pink.
Chloride—One Gm. of Sodium Biphosphate shows no more *Chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 709.
Sulfate—A 200 mg. portion of Sodium Biphosphate shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.
Aluminum, calcium, etc.—A solution of Sodium Biphosphate (1 in 10) does not become turbid when rendered slightly alkaline to litmus paper with ammonia T.S.
Arsenic—A solution of Sodium Biphosphate meets the requirements of the test for *Arsenic*, page 618.
Heavy metals—Dissolve 1 Gm. of Sodium Biphosphate in 20 cc. of water, add 1 cc. of diluted hydrochloric acid, and dilute to 25 cc.: the heavy metals limit, page 657, for Sodium Biphosphate is 20 parts per million.
Assay—Weigh accurately about 2 Gm. of Sodium Biphosphate, previously dried at 100° to constant weight, dissolve it in 10 cc. of cold water, add 20 cc. of a cold, saturated solution of sodium chloride, and titrate the solution with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 120.0 mg. of NaH_2PO_4.
Packaging and storage—Preserve Sodium Biphosphate in well-closed containers.

AVERAGE DOSE—**0.6 Gm.** (approximately 10 grains).

Sodium Borate

SODIUM BORATE

Sodii Boras

Sod. Bor.—Borax, Sodium Tetraborate

$Na_2B_4O_7 \cdot 10H_2O$ Mol. wt. 381.43

Sodium Borate contains not less than 52.3 per cent and not more than 54.9 per cent of $Na_2B_4O_7$, corresponding to not less than 99 per cent of $Na_2B_4O_7 \cdot 10H_2O$.

Description—Sodium Borate occurs as colorless, transparent crystals or as a white, crystalline powder. It is odorless. Its solutions are alkaline to litmus paper and

to phenolphthalein T.S. As Sodium Borate effloresces in warm, dry air, the crystals are often coated with white powder.

Solubility—One Gm. of Sodium Borate dissolves in 16 cc. of water and in about 1 cc. of glycerin. One Gm. dissolves in about 1 cc. of boiling water. It is insoluble in alcohol.

Identification—A solution of Sodium Borate (1 in 20) responds to the tests for *Sodium*, page 663, and for *Borate*, page 659.

Carbonate or bicarbonate—A solution of Sodium Borate (1 in 20) does not effervesce when treated with acids.

Arsenic—A solution of Sodium Borate meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Dissolve 1 Gm. of Sodium Borate in 16 cc. of water and 6 cc. of normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Sodium Borate is 20 parts per million.

Assay—Dissolve about 2 Gm. of Sodium Borate, accurately weighed, in 50 cc. of water. Titrate with half-normal hydrochloric acid, using methyl red T.S. as the indicator. Each cc. of half-normal hydrochloric acid is equivalent to 50.32 mg. of $Na_2B_4O_7$.

Packaging and storage—Preserve Sodium Borate in well-closed containers.

Sodium Bromide

SODIUM BROMIDE

Sodii Bromidum

Sod. Bromid.

NaBr Mol. wt. 102.91

Sodium Bromide, when dried at 110° for 4 hours, contains not less than 99 per cent of NaBr.

Description—Sodium Bromide occurs as white, odorless, cubic crystals, or as a white, granular powder. It absorbs moisture from the air without deliquescing.

Solubility—One Gm. of Sodium Bromide dissolves in 1.2 cc. of water and in 16 cc. of alcohol.

Identification—A solution of Sodium Bromide (1 in 10) responds to the tests for *Sodium*, page 663, and for *Bromide*, page 659.

Loss on drying—When dried at 110° for 4 hours, Sodium Bromide loses not more than 1 per cent of its weight.

Free alkali—Dissolve 1 Gm. of Sodium Bromide in 10 cc. of water, add 0.1 cc. of tenth-normal sulfuric acid and 1 drop of phenolphthalein T.S., and heat to boiling: the solution remains colorless.

Bromate—Drop 1 cc. of diluted sulfuric acid on about 1 Gm. of powdered Sodium Bromide: the salt does not at once become yellow.

Iodide—Add a few drops of ferric chloride T.S. and 1 cc. of chloroform to 10 cc. of a solution of Sodium Bromide (1 in 20), and shake the mixture: the chloroform does not acquire a violet tint.

Sulfate—A solution of 2 Gm. of Sodium Bromide in 50 cc. of water shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic—A solution of Sodium Bromide meets the requirements of the test for *Arsenic*, page 618.

Barium—A 10-cc. portion of a solution of Sodium Bromide (1 in 20), when acidified with hydrochloric acid, is not rendered turbid by the addition of 1 cc. of potassium sulfate T.S.

Heavy metals—Dissolve 2 Gm. of Sodium Bromide in 10 cc. of water, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Sodium Bromide is 10 parts per million.

Assay—Weigh accurately 400 mg. of Sodium Bromide, previously dried at 110° for 4 hours, and dissolve in about 50 cc. of water. Add 50 cc. of tenth-normal silver nitrate, 2 cc. of ferric ammonium sulfate T.S., and 2 cc. of nitric acid. Titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 10.29 mg. of NaBr. Each Gm. of Sodium Bromide, previously dried, is equivalent to not less than 96.2 cc. and not more than 97.9 cc. of tenth-normal silver nitrate.

Packaging and storage—Preserve Sodium Bromide in tight containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

Sodium Carbonate, Monohydrated

MONOHYDRATED SODIUM CARBONATE

Sodii Carbonas Monohydratus

Sod. Carb. Monohyd.

$Na_2CO_3.H_2O$ Mol. wt. 124.02

Monohydrated Sodium Carbonate, when dried at 110° to constant weight, contains not less than 99.5 per cent of Na_2CO_3.

Description—Monohydrated Sodium Carbonate occurs as colorless crystals or as a white, crystalline powder. When exposed to air, under ordinary conditions, it absorbs only a slight percentage of moisture. When exposed to warm, dry air at or above 50°, the salt effloresces, and at 100°, becomes anhydrous.

Solubility—One Gm. of Monohydrated Sodium Carbonate dissolves in 3 cc. of water, and in 1.8 cc. of boiling water.

Identification—

A: A solution of Monohydrated Sodium Carbonate (1 in 10) is strongly alkaline to litmus paper and to phenolphthalein T.S.

B: Monohydrated Sodium Carbonate responds to the tests for *Sodium*, page 663, and for *Carbonate*, page 659.

Loss on drying—Weigh accurately about 2 Gm. of Monohydrated Sodium Carbonate, and dry it at 110° to constant weight: its loss in weight is not less than 10 per cent and not more than 15 per cent.

Heavy metals—Dissolve 1 Gm. of Monohydrated Sodium Carbonate in 10 cc. of water, add 7.5 cc. of diluted hydrochloric acid, and heat to boiling. Add 1 drop of phenolphthalein T.S., and then sufficient sodium hydroxide T.S. to give the solution a faint pink color. Cool, add 2 cc. of diluted acetic acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Monohydrated Sodium Carbonate is 20 parts per million.

Assay—Transfer the anhydrous sodium carbonate obtained in the test for *Loss on drying* to a flask with the aid of 50 cc. of water, and titrate with normal sulfuric acid, methyl orange T.S. being used as the indicator. Each cc. of normal sulfuric acid is equivalent to 53.00 mg. of Na_2CO_3.

Packaging and storage—Preserve Monohydrated Sodium Carbonate in well-closed containers.

Sodium Chloride

SODIUM CHLORIDE

Sodii Chloridum

Sod. Chlorid.

NaCl Mol. wt. 58.45

Sodium Chloride, when dried at 110° for 2 hours, contains not less than 99.5 per cent of NaCl.

Description Sodium Chloride occurs as colorless, hexahedral crystals or as a white, crystalline powder.

Solubility One Gm. of Sodium Chloride dissolves in 2.8 cc. of water, and in about 10 cc. of glycerin. One Gm. dissolves in 2.7 cc. of boiling water. It is slightly soluble in alcohol.

Identification—A solution of Sodium Chloride (1 in 20) responds to the tests for *Sodium*, page 663, and for *Chloride*, page 659.

Free acid or alkali—Dissolve 5 Gm. of Sodium Chloride in 50 cc. of freshly boiled and cooled water and add 2 drops of bromothymol blue pH indicator. If the solution is yellow, it requires not more than 0.1 cc. of fiftieth-normal sodium hydroxide to produce a blue color. If the solution is blue or green, it requires not more than 0.2 cc. of fiftieth-normal hydrochloric acid to produce a yellow color.

Iodide or bromide—Digest 2 Gm. of finely powdered Sodium Chloride for 3 hours with 25 cc. of warm alcohol, cool the mixture, and remove the undissolved salt by filtration. Evaporate the filtrate to dryness, dissolve the residue in 5 cc. of water, add 1 cc. of chloroform, and cautiously introduce, dropwise, with constant agitation, chlorine T.S. which has been diluted with twice its volume of water: the chloroform does not acquire a violet, yellow, or orange color.

Barium—Dissolve 4 Gm. of Sodium Chloride in 20 cc. of water, filter if necessary, and divide the solution into two portions. To one portion add 2 cc. of diluted sulfuric acid and to the other 2 cc. of water: after standing for 2 hours the solutions are equally clear.

Calcium and magnesium—To 20 cc. of a solution of Sodium Chloride (1 in 100) add 2 cc. each of ammonia T.S., ammonium oxalate T.S., and sodium phosphate T.S.: no turbidity is produced in 5 minutes.

Arsenic—A 5-cc. portion of a solution of Sodium Chloride (1 in 10) meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfuric and sulfurous acids (4 parts per million).

Heavy metals—Dissolve 2 Gm. of Sodium Chloride in 23 cc. of water and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Sodium Chloride is 5 parts per million.

Assay—Weigh accurately about 250 mg. of Sodium Chloride, previously dried at 110° for 2 hours, dissolve it in 50 cc. of water in a glass-stoppered flask and add

50 cc. of tenth-normal silver nitrate, 3 cc. of nitric acid, and 3 cc. of nitrobenzene. Shake well, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 5.845 mg. of NaCl.

Packaging and storage—Preserve Sodium Chloride in well-closed containers.

Sodium Chloride Solution, Isotonic

ISOTONIC SODIUM CHLORIDE SOLUTION

Liquor Sodii Chloridi Isotonicus

Liq. Sod. Chlor. Isoton.—Physiological Sodium Chloride Solution, Physiological Salt Solution, Normal Saline Solution

Isotonic Sodium Chloride Solution contains, in each 100 cc., not less than 850 mg. and not more than 950 mg. of NaCl.

Unless otherwise specified, No. 3—Sterile Isotonic Sodium Chloride Solution for Parenteral Use must be dispensed.

No. 1—Non-sterile Isotonic Sodium Chloride Solution

SODIUM CHLORIDE	9 Gm.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Dissolve the Sodium Chloride in sufficient distilled water to make 1000 cc., and filter, returning the filtrate until clear.

No. 2—Sterile Isotonic Sodium Chloride Solution Not for Parenteral Use

Prepare the Solution as directed under No. 1, and sterilize preferably by Process C. See *Sterilization Processes*, page 692. The Solution meets the requirements of the *Sterility Test for Liquids*, page 689.

No. 3—Sterile Isotonic Sodium Chloride Solution for Parenteral Use

Prepare the Solution as directed under No. 1, replacing the distilled water by water for injection. Place the Solution in suitable containers and sterilize preferably by Process C. See *Sterilization Processes*, page 692. The Solution meets the requirements of the *Sterility Test for Liquids*, page 689, and of the *Pyrogen Test*, page 679. It also conforms to the other requirements given under *Injections*, page 664. Bacteriostatic agents must not be added.

Description—Isotonic Sodium Chloride Solution is a clear, colorless solution possessing a slightly saline taste.

pH—The pH of Isotonic Sodium Chloride Solution is between 5 and 7.

Identification—Isotonic Sodium Chloride Solution responds to the tests for *Sodium*, page 663, and for *Chloride*, page 659.
Arsenic—A 20-cc. portion of Isotonic Sodium Chloride Solution meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfuric and sulfurous acids (0.1 part per million).
Heavy metals—To 20 cc. of Isotonic Sodium Chloride Solution, add 2 cc. of diluted acetic acid and dilute with water to 25 cc.: the heavy metals limit, page 657, for Isotonic Sodium Chloride Solution is 0.3 part per million.
Assay—Measure accurately 25 cc. of Isotonic Sodium Chloride Solution into a glass-stoppered flask, dilute with 50 cc. of water, and add 50 cc. of tenth-normal silver nitrate, 3 cc. of nitric acid, and 3 cc. of nitrobenzene. Shake well, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 5.845 mg. of NaCl.
Packaging and storage—Preserve Sterile Isotonic Sodium Chloride Solutions in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Note—Sodium Chloride Solution of a lower or higher concentration of sodium chloride than the official Isotonic Sodium Chloride Solution must not be dispensed when the Isotonic Solution is prescribed.

Labeling—*The title* ***Hypotonic Sodium Chloride Solution*** *applies to solutions which contain less than 850 mg. of sodium chloride in each 100 cc., and the title* ***Hypertonic Sodium Chloride Solution*** *applies to solutions which contain more than 950 mg. of sodium chloride in each 100 cc., and such solutions should be so labeled when dispensed, and the proportion or the weight of sodium chloride in a given volume must be indicated on the label.*

SODIUM CITRATE

Sodii Citras

Sod. Cit.

$Na_3C_6H_5O_7.2H_2O$ Mol. wt. 294.12

Sodium Citrate, when dried at 150° to constant weight, contains not less than 99 per cent of $Na_3C_6H_5O_7$.

Description—Sodium Citrate occurs as colorless crystals, or as a white, crystalline powder. It has a cooling, saline taste.
Solubility—One Gm. of Sodium Citrate dissolves in 1.5 cc. of water and in 0.6 cc. of boiling water. It is insoluble in alcohol.
Identification—
A: A solution of Sodium Citrate (1 in 20) responds to the tests for *Sodium*, page 663, and for *Citrate*, page 660.
B: Upon ignition, Sodium Citrate yields an alkaline residue which effervesces when treated with acids, and imparts a yellow color to a non-luminous flame.
Free alkali—A solution of Sodium Citrate (1 in 20) is slightly alkaline to litmus paper, but no pink color is produced in a 10-cc. portion of the solution by the addition of 1 drop of phenolphthalein T.S.
Loss on drying—Weigh accurately about 2.5 Gm. of Sodium Citrate, and dry it at 150° to constant weight: the loss in weight is not less than 10 per cent and not more than 13 per cent.
Tartrate—To a solution of 1 Gm. of Sodium Citrate in 2 cc. of water, add 1 cc. of potassium acetate T.S. and 1 cc. of acetic acid: no crystalline precipitate forms in the mixture after scratching the sides of the tube with a glass rod.

Heavy metals—Dissolve 2 Gm. of Sodium Citrate in 10 cc. of water, add 7 cc. of diluted hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Sodium Citrate is 10 parts per million.

Assay—Weigh accurately about 2 Gm. of the dried Sodium Citrate obtained in the determination of *Loss on drying*, and proceed as directed under *Alkali Salts of Organic Acids*, page 617. Each cc. of half-normal sulfuric acid is equivalent to 43.01 mg. of $Na_3C_6H_5O_7$.

Packaging and storage—Preserve Sodium Citrate in tight containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

Sodium Citrate Solution, Anticoagulant

ANTICOAGULANT SODIUM CITRATE SOLUTION

Liquor Sodii Citratis Anticoagulans

Liq. Sod. Cit. Anticoag.

Anticoagulant Sodium Citrate Solution is a solution of sodium citrate in isotonic sodium chloride solution and contains, in each 100 cc., not less than 2.3 Gm. and not more than 2.7 Gm. of $Na_3C_6H_5O_7.2H_2O$, and not less than 850 mg. and not more than 950 mg. of NaCl.

Unless otherwise specified, No. 3—Sterile Anticoagulant Sodium Citrate Solution for Parenteral Use must be dispensed.

No. 1—Non-sterile Anticoagulant Sodium Citrate Solution

SODIUM CITRATE	25 Gm.
SODIUM CHLORIDE	9 Gm.
DISTILLED WATER, a sufficient quantity,	
To make	1000 cc.

Dissolve the salts in sufficient distilled water to make 1000 cc., and filter, returning the filtrate until it is free from suspended particles.

No. 2—Sterile Anticoagulant Sodium Citrate Solution Not for Parenteral Use

Prepare the Solution as directed under No. 1, and sterilize preferably by Process C. See *Sterilization Processes*, page 692. The Solution meets the requirements of the *Sterility Test for Liquids*, page 689.

No. 3—Sterile Anticoagulant Sodium Citrate Solution for Parenteral Use

Prepare the Solution as directed under No. 1, replacing the distilled water by water for injection. Place the Solution in suitable containers and sterilize preferably by Process C. See *Sterilization Processes*, page 692. The Solution meets the requirements of the *Sterility Test for Liquids*, page 689, and, when diluted with water for injection to con-

tain 0.5 per cent of sodium citrate, meets the requirements of the *Pyrogen Test*, page 679. It also conforms to the other requirements given under *Injections*, page 664. Bacteriostatic agents must not be added.

Variation in content of sodium citrate—When sodium citrate solutions for parenteral use differ in sodium citrate content from that indicated above, they must conform to the requirements set forth in the preceding paragraph, and to the physical properties and tests described below. The label of such solutions must indicate the percentage or quantity of sodium citrate per unit of volume, and the content of sodium citrate of such solutions, as determined by the assay method given below, is not less than 92 per cent and not more than 108 per cent of the labeled amount.

Description—Anticoagulant Sodium Citrate Solution is a clear, colorless solution, possessing a slightly saline taste.

Identification—Anticoagulant Sodium Citrate Solution, evaporated to a concentration of 1 in 20, responds to the tests for *Sodium*, page 663, for *Citrate*, page 660, and for *Chloride*, page 659.

pH—The pH of Anticoagulant Sodium Citrate Solution is not less than 6.7 and not more than 7.5.

Assay for sodium chloride—Measure accurately 25 cc. of Anticoagulant Sodium Citrate Solution into a glass-stoppered flask, dilute with 50 cc. of water, add 50 cc. of tenth-normal silver nitrate, 3 cc. of nitric acid, and 3 cc. of nitrobenzene. Shake well, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 5.845 mg. of NaCl.

Assay for sodium citrate—Measure accurately 25 cc. of Anticoagulant Sodium Citrate Solution, evaporate to dryness, and carefully ignite the residue until it is thoroughly charred. Then proceed as described under *Alkali Salts of Organic Acids*, page 617, beginning with "After allowing the carbonized mass to cool." Each cc. of half-normal sulfuric acid is equivalent to 49.02 mg. of $Na_3C_6H_5O_7.2H_2O$.

Packaging and storage—Preserve Sterile Anticoagulant Sodium Citrate Solutions in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Sodium Citrate Solution, Anticoagulant Acid, Dextrose

ANTICOAGULANT ACID CITRATE DEXTROSE SOLUTION

Liquor Acidi Citratis Dextrosi Anticoagulans

Liq. Acid. Cit. Dextros. Anticoag.—A.C.D. Solution

Anticoagulant Acid Citrate Dextrose Solution is a sterile solution of sodium citrate, citric acid, and dextrose. It contains, in each 100 cc., not less than 2 Gm. and not more than 2.4 Gm. of $Na_3C_6H_5O_7.2H_2O$, not less than 750 mg. and not more than 850 mg. of $H_3C_6H_5O_7.H_2O$, and not less than 2.3 Gm. and not more than 2.6 Gm. of $C_6H_{12}O_6.H_2O$.

Sodium Citrate	22 Gm.
Citric Acid	8 Gm.
Dextrose	24.5 Gm.
Water for Injection, a sufficient quantity,	
To make	1000 cc.

Dissolve the ingredients in sufficient water for injection to make 1000 cc., and filter until clear. Place immediately in suitable containers, and sterilize, preferably by Process C. See *Sterilization Processes*, page 692. The Solution meets the requirements of the *Sterility Test for Liquids*, page 689, and, when diluted with water for injection to contain 0.5 per cent of sodium citrate, meets the requirements of the *Pyrogen Test*, page 679. Bacteriostatic agents must not be added.

Description—Anticoagulant Acid Citrate Dextrose Solution is a clear, colorless and odorless liquid. It is dextrorotatory.

Identification—Anticoagulant Acid Citrate Dextrose Solution responds to the *Identification test* under *Dextrose*, page 161, and, when concentrated to one half its volume, responds to the identification tests for *Citrate*, page 660, and for *Sodium*, page 663.

pH—The pH of Anticoagulant Acid Citrate Dextrose Solution is from 4.5 to 5.5.

Chloride—A 10-cc. portion of the Solution shows no more *Chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 709.

Assay for sodium citrate—Evaporate exactly 50 cc. of Anticoagulant Acid Citrate Dextrose Solution to dryness, and proceed with the residue as directed under *Alkali Salts of Organic Acids*, page 617. Each cc. of half-normal sulfuric acid is equivalent to 49.02 mg. of $Na_3C_6H_5O_7.2H_2O$.

Assay for free citric acid—Measure exactly 20 cc. of the Solution and titrate with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is equivalent to 7.005 mg. of $H_3C_6H_5O_7.H_2O$.

Assay for Dextrose—Determine the angular rotation of the Solution in a 200-mm. tube using sodium light at 25°. The observed rotation in degrees, multiplied by 1.0425 represents the weight of $C_6H_{12}O_6.H_2O$ in 100 cc. of the solution.

Packaging and storage—Preserve Anticoagulant Acid Citrate Dextrose Solution preferably in hermetic containers or in other suitable containers. See *Containers for Injections*, page 630.

Sodium Hydroxide

SODIUM HYDROXIDE

Sodii Hydroxidum

Sod. Hydrox.—Caustic Soda

NaOH — Mol. wt. 40.01

Sodium Hydroxide contains not less than 95 per cent of total alkali calculated as NaOH, of which not more than 3 per cent is Na_2CO_3.

Caution—Great care is necessary in handling Sodium Hydroxide, as it rapidly destroys organic tissues.

Description—Sodium Hydroxide occurs in white, or nearly white, fused masses, in small pellets, in flakes, in sticks, and in other forms. It is hard and brittle and shows a crystalline fracture. Exposed to the air, Sodium Hydroxide rapidly absorbs carbon dioxide and moisture. Its solutions, even when greatly diluted, are strongly alkaline to litmus paper.

Solubility—One Gm. of Sodium Hydroxide dissolves in 1 cc. of water. It is freely soluble in alcohol.

Identification—A solution of Sodium Hydroxide (1 in 25) responds to the tests for *Sodium*, page 663.

Heavy metals—Dissolve 1 Gm. of Sodium Hydroxide in 5 cc. of water and 11 cc. of diluted hydrochloric acid. Heat to boiling, add 1 drop of phenolphthalein T.S., and then sufficient ammonia T.S., dropwise, to give the solution a faint pink color. Add 2 cc. of diluted acetic acid and dilute to 25 cc. with water: the heavy metals limit, page 657, for Sodium Hydroxide is 30 parts per million.

Potassium—A solution of Sodium Hydroxide (1 in 20), acidified with acetic acid, yields no precipitate on the addition of a few drops of sodium cobaltinitrite T.S.

Insoluble substances and organic matter—A solution of Sodium Hydroxide (1 in 20) is complete, clear, and colorless.

Assay—Dissolve about 1.5 Gm. of Sodium Hydroxide, accurately weighed, in about 40 cc. of recently boiled and cooled water. Cool the solution to 15°, and titrate with normal sulfuric acid, using phenolphthalein T.S. as the indicator. At the discharge of the pink color of the indicator, record the volume of acid solution required, add 3 drops of methyl orange T.S., and continue the titration to the production of a persistent pink color. Each cc. of normal sulfuric acid consumed is equivalent to 40.01 mg. of NaOH. Each cc. difference between the number of cc. of normal sulfuric acid consumed in the methyl orange and phenolphthalein titrations is equivalent to 106.0 mg. of Na_2CO_3.

Packaging and storage—Preserve Sodium Hydroxide in tight containers.

Sodium Hypochlorite Solution

SODIUM HYPOCHLORITE SOLUTION

Liquor Sodii Hypochloritis

Liq. Sod. Hypochlor.

Sodium Hypochlorite Solution contains not less than 4 per cent and not more than 6 per cent of NaClO.

Caution—This Solution is not suitable for application to wounds.

Description—Sodium Hypochlorite Solution is a clear, pale, greenish yellow liquid, having an odor of chlorine. It is affected by light.

Identification—

A: Sodium Hypochlorite Solution at first colors red litmus paper blue and then bleaches it.

B: The addition of diluted hydrochloric acid to Sodium Hypochlorite Solution causes an evolution of chlorine.

C: The solution obtained in *Identification test B* responds to the flame test for *Sodium*, page 663.

Assay—Weigh accurately, in a glass-stoppered flask, about 3 cc. of Sodium Hypochlorite Solution, and dilute it with 50 cc. of water Add 2 Gm. of potassium iodide and 10 cc. of acetic acid, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 3.723 mg. of NaClO.

Packaging and storage—Preserve Sodium Hypochlorite Solution in tight, light-resistant containers, preferably at a temperature not above 25°.

NOTE—If "*Labarraque's Solution*" is ordered, Sodium Hypochlorite Solution, diluted with an equal volume of water, is to be dispensed.

Sodium Iodide

SODIUM IODIDE

Sodii Iodidum

Sod. Iodid.

NaI Mol. wt. 149.92

Sodium Iodide, when dried at 120° to constant weight, contains not less than 99 per cent of NaI.

Description—Sodium Iodide occurs as colorless, odorless crystals, or as a white, crystalline powder. In moist air Sodium Iodide cakes and then deliquesces, and frequently undergoes decomposition, developing a brown tint.

Solubility—One Gm. of Sodium Iodide dissolves in 0.6 cc. of water, in about 2 cc. of alcohol, and in about 1 cc. of glycerin.

Identification—A solution of Sodium Iodide (1 in 20) responds to the tests for *Sodium*, page 663, and for *Iodide*, page 661.

Free alkali—Dissolve 1 Gm. of Sodium Iodide in 10 cc. of water, and add 0.15 cc. of tenth-normal sulfuric acid: no red color is produced by the addition of 1 drop of phenolphthalein T.S.

Loss on drying—Dry Sodium Iodide at 120° to constant weight: the loss in weight does not exceed 5 per cent.

Iodate, nitrite, thiosulfate, and barium—Dissolve 500 mg. of Sodium Iodide in 10 cc. of water which has been previously boiled and cooled, and add 2 drops of diluted sulfuric acid: no distinct yellow color appears within 30 seconds, and no turbidity develops in 1 minute.

Nitrate, nitrite, and ammonia—Add 5 cc. of sodium hydroxide T.S. and about 200 mg. of aluminum wire to a solution of 1 Gm. of Sodium Iodide in 5 cc. of water, contained in a test tube of about 40-cc. capacity. Insert a pledget of purified cotton in the upper portion of the test tube, and place a piece of moistened red litmus paper over the mouth of the tube. Heat the test tube and its contents on a water bath for 15 minutes: no blue coloration of the paper is discernible.

Heavy metals—Dissolve 2 Gm. of Sodium Iodide in 23 cc. of water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Sodium Iodide is 10 parts per million.

Potassium—A solution of 1 Gm. of Sodium Iodide in 2 cc. of water yields no precipitate with 1 cc. of sodium bitartrate T.S.

Assay—Dry about 500 mg. of Sodium Iodide at 120° to constant weight, weigh accurately, and dissolve it in about 10 cc. of water. Add 35 cc. of hydrochloric acid and 5 cc. of chloroform, and titrate with twentieth-molar potassium iodate until the purple color of iodine disappears from the chloroform. Add the last portions of the iodate solution, dropwise, agitating the mixture vigorously. After the chloroform has been decolorized, allow the mixture to stand for 5 minutes. If the chloroform develops a purple color, titrate further with the iodate solution. Each cc. of twentieth-molar potassium iodate is equivalent to 14.99 mg. of NaI.
Packaging and storage—Preserve Sodium Iodide in tight containers.

AVERAGE DOSE—**0.3 Gm.** (approximately 5 grains).

Sodium Lactate Injection

SODIUM LACTATE INJECTION

Injectio Sodii Lactatis

Inj. Sod. Lact.

Sodium Lactate Injection is a sterile solution of sodium lactate ($NaC_3H_5O_3$) in water for injection. It contains not less than 95 per cent and not more than 110 per cent of the labeled amount of $NaC_3H_5O_3$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Sodium Lactate Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—
A: Superimpose 2 cc. of the Injection on 5 cc. of a solution of catechol in sulfuric acid (1 in 100): a deep red color is produced at the zone of contact.
B: Add 5 cc. of diluted sulfuric acid and 2 cc. of potassium permanganate T.S. to 2 cc. of the Injection, and heat: the odor of acetaldehyde is evolved.

pH—The pH of Sodium Lactate Injection, diluted if necessary to approximately fifth-molar (25 mg. per cc.), is between 6.0 and 7.3.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 300 mg. of sodium lactate, to a suitable crucible or dish, and evaporate to dryness Heat the residue at first gently, then gradually raise the temperature until the residue is thoroughly carbonized, and proceed as described for the *Assay of Alkali Salts of Organic Acids*, page 617, beginning with the words "After allowing the carbonized mass to cool," using tenth-normal sulfuric acid instead of half-normal acid, and titrating the excess of acid with tenth-normal sodium hydroxide. Each cc. of tenth-normal sulfuric acid is equivalent to 11.21 mg. of $NaC_3H_5O_3$.

Pyrogen—Sodium Lactate Injection, diluted, if necessary, with water for injection to approximately fifth-molar (25 mg. per cc.), meets the requirements of the *Pyrogen test*, page 679.

Packaging and storage—Preserve Sodium Lactate Injection in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Sodium Lauryl Sulfate

SODIUM LAURYL SULFATE

Sodii Laurylis Sulfas

Sod. Lauryl. Sulf.

Sodium Lauryl Sulfate is a mixture of sodium alkyl sulfates consisting chiefly of sodium lauryl sulfate [$CH_3(CH_2)_{10}CH_2OSO_3Na$].

Description—Sodium Lauryl Sulfate occurs as small, white or light yellow crystals having a slight, characteristic odor.

Solubility—One Gm. of Sodium Lauryl Sulfate dissolves in 10 cc. of water, forming an opalescent solution.

Identification—Sodium Lauryl Sulfate responds to the tests for *Sodium*, page 663, and for *Sulfate*, page 663.

Free alkali—Dissolve 1 Gm. of Sodium Lauryl Sulfate in 100 cc. of water, and titrate with tenth-normal hydrochloric acid, using phenol red T.S. as the indicator: not more than 0.6 cc. of tenth-normal hydrochloric acid is required to produce a yellow color.

Sodium chloride—Dissolve about 5 Gm. of Sodium Lauryl Sulfate, accurately weighed, in about 50 cc. of water. Neutralize the solution with nitric acid (1 in 20), using litmus paper as the indicator, add 2 cc. of potassium chromate T.S., and titrate with tenth-normal silver nitrate. Each cc. of tenth-normal silver nitrate is equivalent to 5.845 mg. of sodium chloride. The per cent of sodium chloride plus the per cent of sodium sulfate does not exceed 10 per cent.

Sodium sulfate—Transfer about 1 Gm. of Sodium Lauryl Sulfate, accurately weighed, to a 400-cc. beaker, add 10 cc. of water, heat the mixture, and stir until completely dissolved. To the hot solution add 100 cc. of alcohol, cover, and digest at a temperature just below the boiling point for 2 hours. Filter, while hot, through a Gooch crucible, and wash the precipitate with 100 cc. of hot alcohol. Dissolve the precipitate in the crucible by washing with about 150 cc. of water. Collect the washings in a beaker. Acidify with 10 cc. of hydrochloric acid, heat to boiling, add 25 cc. of barium chloride T.S., and allow to stand overnight. Collect the precipitate of barium sulfate on a tared Gooch crucible, wash until free from chloride, dry, ignite, and weigh. The weight of barium sulfate multiplied by 0.6086 represents the weight of Na_2SO_4. The per cent of sodium sulfate plus the per cent of sodium chloride does not exceed 10 per cent.

Unsulfated alcohols—Dissolve about 10 Gm. of Sodium Lauryl Sulfate, accurately weighed, in 100 cc. of water, and add 100 cc. of alcohol. Transfer the solution to a separator, and extract with three 50-cc. portions of petroleum benzin. If an emulsion forms, sodium chloride may be added to promote a separation of the two layers. Wash the combined petroleum benzin extracts with three 50-cc. portions of water, and dry with anhydrous sodium sulfate. Filter the petroleum benzin extract into a tared beaker, evaporate on a water bath until the odor of petroleum benzin is no longer perceptible, heat the residue at 100° for about 15 minutes, cool, and weigh. The weight of the residue is not more than 4 per cent of the weight of the sample taken.

Total alcohols—Transfer about 5 Gm. of Sodium Lauryl Sulfate, accurately weighed, to an 800-cc. Kjeldahl flask, add 150 cc. of water, 50 cc. of hydrochloric acid and a few boiling chips. Attach a reflux condenser to the Kjeldahl flask, heat carefully to avoid excessive frothing, and then boil for about 4 hours. Cool the flask, rinse the condenser with ether, collecting the ether in the flask, and transfer the contents

to a 500-cc. separator, rinsing the flask twice with ether and adding the washings to the separator. Extract the solution with two successive 75-cc. portions of ether, evaporate the combined ether extracts in a tared beaker on a steam bath, dry the residue at 100° for about 15 minutes, cool, and weigh. The residue represents the total alcohols, and is not less than 59 per cent of the weight of Sodium Lauryl Sulfate taken.

Packaging and storage—Preserve Sodium Lauryl Sulfate in well-closed containers.

NOTE—Sodium Lauryl Sulfate conforming to the standards of this monograph is designed for external use only.

SODIUM MORRHUATE INJECTION

Injectio Sodii Morrhuatis

Inj. Sod. Morrh.

Sodium Morrhuate Injection is a sterile solution of the sodium salts of the fatty acids of cod liver oil. It contains, when determined by the assay method described below, not less than 93 per cent and not more than 107 per cent of the labeled amount of sodium morrhuate. A suitable preservative, not to exceed 0.5 per cent, and ethyl or benzyl alcohol, not to exceed 3 per cent, may be added. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Sodium Morrhuate Injection preferably by Process E or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—Evaporate about 5 cc. of the chloroform solution of the fatty acids obtained in the test for *Iodine value of the fatty acids* nearly to dryness on a steam bath, dissolve the residue in 1 cc. of chloroform, and add 1 drop of sulfuric acid: a transient red color is produced which changes to brown red.

Free acid or free alkali—Add 5 cc. of alcohol and 2 drops of phenolphthalein T.S. to 5 cc. of the Injection. If no red color is produced it requires not more than 0.5 cc. of tenth-normal sodium hydroxide to impart a distinct red color. If a red color is produced, it requires not more than 0.3 cc. of tenth-normal acid to discharge it. For concentrations of sodium morrhuate other than 5 per cent, no larger than proportional volumes of alkali and acid are required.

Iodine value of the fatty acids—Evaporate to dryness at about 60° in a tared beaker the petroleum benzin solution of the fatty acids obtained in the *Assay*, then dry the residue in a vacuum desiccator over sulfuric acid over night, and weigh. Dissolve the residue in sufficient chloroform to make 100 cc., and determine the iodine value, page 647, on a 25-cc. aliquot of the solution: it is not less than 130.

Assay—Transfer an accurately measured volume of Sodium Morrhuate Injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 500 mg. of sodium morrhuate, to a small separator, containing an accurately measured volume of about 30 cc. of tenth-normal sulfuric acid, then add 25 cc. of petroleum benzin, shake gently, and allow to separate. Withdraw the water layer into a beaker or flask, wash the petroleum benzin layer with two suc-

cessive portions of 10 cc. each of water, adding the washings to the main water solution, and titrate the excess of acid in the water solution with tenth-normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 32.4 mg. of sodium morrhuate.

Packaging and storage—Preserve Sodium Morrhuate Injection in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Sizes—Sodium Morrhuate Injection usually available contains the following amounts of sodium morrhuate: 5 per cent solution in containers of 2 cc., 5 cc., and 30 cc.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

Sodium Nitrite

SODIUM NITRITE

Sodii Nitris

Sod. Nitris

$NaNO_2$ Mol. wt. 69.01

Sodium Nitrite, when dried over sulfuric acid for 4 hours, contains not less than 97 per cent of $NaNO_2$.

Description—Sodium Nitrite occurs as a white to slightly yellow, granular powder, or as white or nearly white, opaque, fused masses or sticks. It has a mild, saline taste and is deliquescent in air. Its solutions are slightly alkaline to litmus paper.

Solubility—One Gm. of Sodium Nitrite dissolves in 1.5 cc. of water. It is sparingly soluble in alcohol.

Identification—A solution of Sodium Nitrite responds to the tests for *Sodium*, page 663, and for *Nitrite*, page 662.

Loss on drying—When dried over sulfuric acid for 4 hours, Sodium Nitrite loses not more than 1 per cent of its weight.

Heavy metals—Dissolve 1 Gm. of Sodium Nitrite in 6 cc. of diluted hydrochloric acid, and evaporate to dryness on a water bath. Reduce the residue to a coarse powder, and continue heating on the water bath until the odor of hydrochloric acid is no longer perceptible. Dissolve the residue in 23 cc. of water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Sodium Nitrite is 20 parts per million.

Assay—Weigh accurately about 1 Gm. of Sodium Nitrite, previously dried over sulfuric acid for 4 hours, and dissolve it in sufficient water to make exactly 100 cc. Add exactly 10 cc. of this solution, from a pipette, to a mixture of 50 cc. of tenth-normal potassium permanganate, 100 cc. of water, and 5 cc. of sulfuric acid. When adding the Sodium Nitrite solution, immerse the tip of the pipette beneath the surface of the permanganate mixture. Warm the liquid to 40°, allow it to stand for 5 minutes, and add 25 cc. of tenth-normal oxalic acid. Heat the mixture to about 80°, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 3.450 mg. of $NaNO_2$.

Packaging and storage—Preserve Sodium Nitrite in tight containers.

AVERAGE DOSE—**60 mg.** (approximately **1 grain**).

SODIUM NITRITE TABLETS

Tabellæ Sodii Nitritis

Tab. Sod. Nitrit.

Sodium Nitrite Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $NaNO_2$.

Identification—A filtered solution of Sodium Nitrite Tablets responds to the test for *Sodium*, page 663, and for *Nitrite*, page 662.

Assay—Weigh a counted number of not less than 20 Sodium Nitrite Tablets, dissolve them in about 100 cc. of water in a beaker, and filter the solution into a 200-cc. volumetric flask. Wash the beaker and filter with several portions of water into the flask, then add sufficient water to the flask to make exactly 200 cc., and mix well. Transfer a volume of the solution, equivalent to about 350 mg. of sodium nitrite, to a glass stoppered flask. Add 15 cc. of a saturated solution of potassium chlorate and 40 cc. of tenth-normal silver nitrate, accurately measured, and follow with 5 cc. of nitric acid. Add 3 cc. of nitrobenzene, shake vigorously, then titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as indicator. Each cc. of tenth-normal silver nitrate is equivalent to 20.7 mg. of $NaNO_2$.

If the chloride (Cl) content of the Tablets is more than 0.1 per cent correct the assay as follows: Transfer to a glass-stoppered flask the same volume of the tablet solution as was used in the assay, dilute, if necessary, with water to about 50 cc., add exactly 20 cc. of tenth-normal silver nitrate, then 5 cc. of nitric acid. Heat on a steam bath until no more nitrous fumes are evolved and the solution is colorless. Cool, add 3 cc. of nitrobenzene, shake vigorously, and then titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator, and deduct the volume of tenth-normal silver nitrate consumed in this test from the volume consumed in the assay.

Storage—Preserve Sodium Nitrite Tablets in tight containers.

Sizes—Sodium Nitrite Tablets usually available contain the following amounts of sodium nitrite: 30 and 60 mg. (½ and 1 grain).

AVERAGE DOSE OF SODIUM NITRITE—**60 mg.** (approximately 1 grain).

SODIUM PERBORATE

Sodii Perboras

Sod. Perbor.

$NaBO_3$ $4H_2O$ Mol. wt. 153.88

Sodium Perborate contains not less than 9 per cent of available oxygen, corresponding to about 86.5 per cent of $NaBO_3.4H_2O$.

Description—Sodium Perborate occurs as white, crystalline granules or as a white powder. It is odorless, and has a saline taste. It is stable in cool and dry air, but is decomposed with the evolution of oxygen in warm or in moist air. In solution, Sodium Perborate decomposes into sodium metaborate and hydrogen peroxide,

the solution gradually evolving oxygen. Oxygen is evolved more rapidly if the solution is warmed.

Solubility—One Gm. of Sodium Perborate dissolves in about 40 cc. of water.

Identification—

A: A saturated solution of Sodium Perborate is alkaline to phenolphthalein T.S., and when acidified with hydrochloric acid responds to the identification tests for *Sodium*, page 663, and for *Borate*, page 659.

B: Agitate a mixture of 1 cc. of a solution of Sodium Perborate (1 in 50), 1 cc. of diluted sulfuric acid, a few drops of potassium dichromate T.S., and 2 cc. of ether: the ether acquires a blue color.

Heavy metals—Dissolve 1 Gm. of Sodium Perborate in 10 cc. of water and 5 cc. of diluted hydrochloric acid. Evaporate to dryness on a water bath, with frequent stirring. Dissolve the residue in 23 cc. of water, and add 2 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 657, for Sodium Perborate is 20 parts per million.

Assay—Dissolve about 250 mg. of Sodium Perborate, accurately weighed, in a mixture of 50 cc. of water and 10 cc. of diluted sulfuric acid, and titrate the solution with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 0.80 mg. of available oxygen.

Packaging and storage—Preserve Sodium Perborate in tight containers, preferably at a temperature not above 30°

Sodium Phosphate

SODIUM PHOSPHATE

Sodii Phosphas

Sod. Phos.—Dibasic Sodium Phosphate, Disodium Orthophosphate, Disodium Hydrogen Phosphate

$Na_2HPO_4.7H_2O$ Mol. wt. 268.09

Sodium Phosphate, when dried to constant weight at 110°, contains not less than 98 per cent of Na_2HPO_4.

Description—Sodium Phosphate occurs as a colorless or white, granular salt. It effloresces in warm, dry air. Its solutions are alkaline to phenolphthalein T.S.

Solubility—One Gm. of Sodium Phosphate dissolves in 4 cc. of water. It is very slightly soluble in alcohol.

Identification—A solution of Sodium Phosphate (1 in 20) responds to the tests for *Sodium*, page 663, and for *Phosphate*, page 662.

Loss on drying—Dry Sodium Phosphate to constant weight at 110°: the loss in weight is not less than 43 per cent and not more than 50 per cent.

Insoluble substances—Dissolve 10 Gm. of Sodium Phosphate in 100 cc. of water, filter through a tared filtering crucible, wash the insoluble residue with hot water, and dry to constant weight at 110°: the residue does not exceed 20 mg.

Chloride—One Gm. of Sodium Phosphate shows no more *Chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 200-mg. portion of Sodium Phosphate shows no more *Sulfate* than corresponds to 0.5 cc. of fiftieth-normal sulfuric acid, page 709.

Arsenic—A solution of Sodium Phosphate meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Dissolve 2 Gm. of Sodium Phosphate in 10 cc. of water, add 4 cc. of

diluted hydrochloric acid, and dilute to 25 cc.: the heavy metals limit, page 657, for Sodium Phosphate is 10 parts per million.

Assay—Weigh accurately about 300 mg. of Sodium Phosphate previously dried to constant weight at 110°, and dissolve it in about 100 cc. of water in a beaker. Add to the solution 1 cc. of hydrochloric acid, then add an excess (20 cc.) of magnesia mixture T.S. and 40 cc. of ammonia T.S. Mix well, and set it aside for 4 hours. Collect the precipitate in a tared, previously ignited filtering crucible, and wash it with a mixture of 1 volume of ammonia T.S. and 3 volumes of water, until free from chloride. Dry, and ignite the precipitate to constant weight. The weight of the magnesium pyrophosphate obtained, multiplied by 1.276, indicates its equivalent of Na_2HPO_4.

Packaging and storage—Preserve Sodium Phosphate in tight containers.

AVERAGE DOSE—**4 Gm.** (approximately 1 drachm).

Sodium Phosphate, Effervescent

EFFERVESCENT SODIUM PHOSPHATE

Sodii Phosphas Effervescens

Sod. Phos. Eff.

EXSICCATED SODIUM PHOSPHATE, dried and powdered..	200 Gm.
SODIUM BICARBONATE, in dry powder................	477 Gm.
TARTARIC ACID, in dry powder......................	252 Gm.
CITRIC ACID, uneffloresced crystals.................	162 Gm.
To make about....................	1000 Gm.

Powder the citric acid, mix it intimately with the exsiccated sodium phosphate and tartaric acid, and thoroughly incorporate the sodium bicarbonate.

Place the mixed powders on a plate of glass or in a suitable dish in an oven previously heated to between 93° and 104°. Manipulate the mixture carefully with a spatula which is acid-resistant, and when it has become moist rub it through a No. 6 tinned-iron sieve. Dry the granules at a temperature not exceeding 54°, immediately transfer the salt to suitable containers, and seal them tightly.

NOTE—The proportions of tartaric acid and citric acid may be varied if desired, but their combined acidity must be equivalent to the acidity indicated in the official formula.

Packaging and storage—Preserve Effervescent Sodium Phosphate in tight containers.

AVERAGE DOSE—**10 Gm.** (approximately 2½ drachms).

Sodium Phosphate, Exsiccated

EXSICCATED SODIUM PHOSPHATE

Sodii Phosphas Exsiccatus

Sod. Phos. Exsic.—Dried Sodium Phosphate

Na_2HPO_4 Mol. wt. 141.98

Exsiccated Sodium Phosphate, when dried at 110° to constant weight, contains not less than 98 per cent of Na_2HPO_4.

Description—Exsiccated Sodium Phosphate is a white powder which readily absorbs moisture.
Solubility—One Gm. of Exsiccated Sodium Phosphate dissolves in 8 cc. of water. It is insoluble in alcohol.
Identification—A solution of Exsiccated Sodium Phosphate (1 in 30) responds to the tests for *Sodium*, page 663, and for *Phosphate*, page 662.
Loss on drying—Dry Exsiccated Sodium Phosphate at 110° to constant weight: its loss in weight does not exceed 5 per cent.
Other tests—Proper allowance being made for the absence of water of hydration, Exsiccated Sodium Phosphate meets the requirements of the tests for *Insoluble substances*, *Chloride*, *Sulfate*, *Arsenic*, and *Heavy metals*, under *Sodium Phosphate*, page 502.
Assay—Proceed as directed under *Sodium Phosphate*, using about 200 mg. of Exsiccated Sodium Phosphate, previously dried to constant weight at 110° and accurately weighed. The weight of magnesium pyrophosphate obtained, multiplied by 1.276, indicates its equivalent in Na_2HPO_4.
Packaging and storage—Preserve Exsiccated Sodium Phosphate in tight containers.

AVERAGE DOSE—2 Gm. (approximately 30 grains).

Sodium Salicylate

SODIUM SALICYLATE

Sodii Salicylas

Sod. Salicyl.

$NaC_7H_5O_3$ Mol. wt. 160.11

Sodium Salicylate, when dried at 110° for 4 hours, contains not less than 99.5 per cent of $NaC_7H_5O_3$.

Description—Sodium Salicylate occurs as a white, microcrystalline powder, as scales, or as an amorphous powder. It is colorless or has not more than a faint, pink tinge. It is odorless, or has a faint, characteristic odor, and a sweet, saline taste. It is affected by light.
Solubility—One Gm. of Sodium Salicylate dissolves in 1 cc. of water, in 10 cc. of alcohol, and in about 4 cc. of glycerin. It is very soluble in boiling water and in boiling alcohol.
Identification—A solution of Sodium Salicylate (1 in 20) responds to the tests for *Sodium*, page 663, and for *Salicylate*, page 663.
Loss on drying—When dried for 4 hours at 110°, Sodium Salicylate loses not more than 0.5 per cent of its weight

Color of solution and reaction—A freshly made solution of Sodium Salicylate (1 in 10) is colorless or nearly so, and is neutral or slightly acid to litmus paper.

Sulfite or thiosulfate—Add 1 cc. of hydrochloric acid to a solution of 1 Gm. of Sodium Salicylate in 20 cc. of water, and filter the liquid: not more than 0.15 cc. of tenth-normal iodine is required to produce a yellow color in the filtrate.

Heavy metals—Dissolve 2 Gm. of Sodium Salicylate in 46 cc. of water. Add, with constant stirring, 4 cc. of diluted hydrochloric acid, filter, and use 25 cc. of the filtrate: the heavy metals limit, page 657, for Sodium Salicylate is 20 parts per million.

Assay—Weigh accurately about 2 Gm. of Sodium Salicylate, previously dried at 110° for 4 hours, and transfer it to a separator. Add 75 cc. of ether and 10 drops of bromophenol blue T.S., and titrate with half-normal hydrochloric acid, mixing the water and ether layers intimately by vigorous stirring until a permanent pale green color is produced in the water layer. Draw off the water layer into a small flask, wash the ether layer once with 5 cc. of water, and add this to the water layer. Add 20 cc. of ether to the combined water solutions, and mix intimately. Continue the titration with vigorous shaking until a permanent, pale green color is produced in the water layer. Each cc. of half-normal hydrochloric acid is equivalent to 80.05 mg. of $NaC_7H_5O_3$.

Packaging and storage—Preserve Sodium Salicylate in well-closed, light-resistant containers.

AVERAGE DOSE—**1 Gm.** (approximately 15 grains).

Sodium Salicylate Tablets

SODIUM SALICYLATE TABLETS

Tabellæ Sodii Salicylatis

Tab. Sod. Salicyl.

Sodium Salicylate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $NaC_7H_5O_3$.

Identification—

A: Digest a quantity of powdered Sodium Salicylate Tablets, equivalent to about 1 Gm. of sodium salicylate, with 20 cc. of water, and filter. The filtrate responds to the flame test for *Sodium*, page 663, and to the tests for *Salicylate*, page 663.

B: To 10 cc. of the filtrate obtained in *Test A*, add a slight excess of diluted hydrochloric acid, collect the precipitate of salicylic acid on a filter, wash it with small portions of cold water until the washings are free from chloride, and dry at about 100°. The salicylic acid so obtained melts between 158° and 161°, page 667.

Assay—Dissolve 20 Sodium Salicylate Tablets in sufficient water to make exactly 200 cc., and mix well. If the tablets are coated, reduce them to a powder without appreciable loss, triturate the resulting powder with about 25 cc. of water, or more, if necessary, then transfer completely to a flask, dilute with water to exactly 250 cc., and mix well. Filter through a small, dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer an accurately measured aliquot of the filtrate, corresponding to about 300 mg. of sodium salicylate, to a separator, add 2 cc. of diluted hydrochloric acid, and extract the liberated salicylic acid with several 20-cc. portions of ether. Transfer the ether solution to a flask, and evaporate the ether with the aid of a current of air, taking care not to volatilize any salicylic acid. Add

3 cc. of alcohol to dissolve all of the salicylic acid, then add 15 cc. of water, and titrate with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is equivalent to 16.01 mg. of $NaC_7H_5O_3$.

Storage—Preserve Sodium Salicylate Tablets in well-closed containers.

Sizes—Sodium Salicylate Tablets usually available contain the following amounts of sodium salicylate: 300 and 600 mg. (5 and 10 grains)

AVERAGE DOSE OF SODIUM SALICYLATE—1 **Gm.** (approximately 15 grains).

Sodium Stearate

SODIUM STEARATE

Sodii Stearas

Sod. Stear.

A mixture of varying proportions of sodium stearate ($NaC_{18}H_{35}O_2$) and sodium palmitate ($NaC_{16}H_{31}O_2$).

Description—Sodium Stearate is a fine, white powder, soapy to the touch. It usually has a slight, tallow-like odor. It is affected by light. Its solutions are alkaline to phenolphthalein T.S.

Solubility—Sodium Stearate is slowly soluble in cold water and in alcohol, but is readily soluble in these solvents when hot.

Identification—

A: When heated, Sodium Stearate fuses. At a higher temperature it decomposes, giving off inflammable vapors and the odor of burning fat, finally leaving a residue which, when moistened with water, is alkaline to litmus paper, effervesces with acids, and colors a non-luminous flame intensely yellow.

B: Dissolve 25 Gm. of Sodium Stearate in 300 cc. of hot water, add 60 cc. of diluted sulfuric acid and heat the solution, with frequent stirring, until the fatty acids separate cleanly as a transparent layer. Wash the fatty acids with boiling water until free from sulfate, collect them in a small beaker, and place on a steam bath until the water has settled and the fatty acids are clear. Allow the acids to cool, pour off the water layer, then melt the acids, filter into a dry beaker while hot, and dry for 20 minutes at 100°: the solidification temperature of the fatty acids is not below 54°, page 645.

Loss on drying—Tare a beaker containing about 1 Gm. of washed sand, which has been previously dried at 110°, add about 500 mg. of Sodium Stearate, and reweigh. Add 10 cc. of alcohol, evaporate the mixture to dryness at about 80°, and dry to constant weight at 110°: the loss in weight does not exceed 5 per cent.

Alcohol-insoluble substances—Boil 1 Gm. of Sodium Stearate with 25 cc. of alcohol under a reflux condenser: it dissolves completely and the resulting solution is clear or not more than slightly opalescent.

Free alkali and free acids—Weigh accurately 2 Gm. of Sodium Stearate, dissolve it in 50 cc. of neutralized alcohol with the aid of a little heat, and add 3 drops of phenolphthalein T.S.: no pink color is produced. Titrate the solution with tenth-normal sodium hydroxide until a pink color is produced: not less than 0.60 cc. and not more than 0.85 cc. of tenth-normal sodium hydroxide is required.

Packaging and storage—Preserve Sodium Stearate in well-closed, light-resistant containers.

SODIUM SULFATE

Sodii Sulfas

Sod. Sulf.—Glauber's Salt

$Na_2SO_4 . 10H_2O$ Mol wt. 322.21

Sodium Sulfate, when dried at 110° to constant weight, contains not less than 99 per cent of Na_2SO_4.

Description—Sodium Sulfate occurs as large, colorless, odorless, transparent crystals or as a granular powder. It effloresces rapidly in air. Sodium Sulfate liquefies in its water of hydration at about 33°. At 100° it loses all of its water of hydration. Its solutions are neutral to litmus paper.

Solubility—One Gm. of Sodium Sulfate dissolves in 1.5 cc. of water. It is insoluble in alcohol but soluble in glycerin.

Identification—A solution of Sodium Sulfate (1 in 20) responds to the tests for *Sodium*, page 663, and for *Sulfate*, page 663.

Loss on drying—Weigh accurately about 1 Gm. of Sodium Sulfate, and dry it to constant weight at 110°: the loss in weight is not less than 51 per cent and not more than 57 per cent.

Arsenic—A solution of Sodium Sulfate meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Dissolve 2 Gm. of Sodium Sulfate in 10 cc. of water, add 2 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Sodium Sulfate is 10 parts per million.

Assay—Weigh accurately about 400 mg. of the dried Sodium Sulfate obtained in the test for *Loss on drying*, dissolve it in 200 cc. of water, and add 1 cc. of hydrochloric acid. Heat to boiling, and gradually add an excess of hot barium chloride T.S. Heat the mixture for 1 hour on a water bath, collect the precipitate of barium sulfate on a filter, wash it until free from chloride, dry, ignite, and weigh. The weight of the barium sulfate thus obtained, multiplied by 0.6086, indicates its equivalent of Na_2SO_4.

Packaging and storage—Preserve Sodium Sulfate in tight containers, preferably at a temperature not above 30°.

AVERAGE DOSE—**15 Gm.** (approximately 4 drachms).

EXSICCATED SODIUM SULFITE

Sodii Sulfis Exsiccatus

Sod. Sulfis Exsic.

Na_2SO_3 Mol. wt. 126.05

Exsiccated Sodium Sulfite contains not less than 95 per cent of Na_2SO_3.

Description—Exsiccated Sodium Sulfite occurs as a white, odorless powder, and possesses a cooling, saline, sulfurous taste. It undergoes oxidation in air. Its solutions are alkaline to litmus paper and to phenolphthalein T.S.

Solubility—One Gm. of Exsiccated Sodium Sulfite dissolves in about 4 cc. of water. It is sparingly soluble in alcohol.

Identification—A solution of Exsiccated Sodium Sulfite (1 in 20) responds to the tests for *Sodium*, page 663, and for *Sulfite*, page 663.
Thiosulfate—Dissolve 1 Gm. of Exsiccated Sodium Sulfite in 15 cc. of water, and slowly add 5 cc. of hydrochloric acid: no turbidity is produced within 5 minutes.
Arsenic—Dissolve 200 mg. of Exsiccated Sodium Sulfite in 5 cc. of water, and add 1 cc. of nitric acid gradually. Then add 1 cc. of sulfuric acid, and evaporate until strong fumes of sulfur trioxide are evolved. Cool cautiously, and add 10 cc. of water: the resulting solution meets the requirements of the test for *Arsenic*, page 618.
Heavy metals—Dissolve 1 Gm. of Exsiccated Sodium Sulfite in 5 cc. of water, add 2 cc. of hydrochloric acid, and evaporate to dryness on a water bath. Add 3 cc. of hot water to the residue, and 1 cc. of hydrochloric acid, and evaporate again to complete dryness on a water bath. Dissolve the residue in 23 cc. of water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Exsiccated Sodium Sulfite is 20 parts per million.
Assay—Accurately weigh about 250 mg. of Exsiccated Sodium Sulfite, and add it to 50 cc. of tenth-normal iodine, contained in a glass-stoppered flask, and stopper the flask. After standing 5 minutes, add 1 cc. of hydrochloric acid, and titrate the excess of iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 6.303 mg. of Na_2SO_3.
Packaging and storage—Preserve Exsiccated Sodium Sulfite in tight containers.

Sodium Thiosulfate

SODIUM THIOSULFATE

Sodii Thiosulfas

Sod. Thiosulf.—"Sodium Hyposulfite"

$Na_2S_2O_3 . 5H_2O$ Mol. wt. 248.19

Sodium Thiosulfate, when dried at 100° to constant weight, contains not less than 99 per cent of $Na_2S_2O_3$.

Description—Sodium Thiosulfate occurs as large, colorless crystals or as a coarse, crystalline powder. It is deliquescent in moist air and effloresces in dry air at a temperature above 33°. Its solutions are neutral or faintly alkaline to litmus paper.
Solubility—One Gm. of Sodium Thiosulfate dissolves in 0.5 cc. of water. It is insoluble in alcohol.
Identification—
A: A solution of Sodium Thiosulfate responds to the tests for *Sodium*, page 663, and for *Thiosulfate*, page 663.
B: A solution of Sodium Thiosulfate discharges the color of solutions of iodine and of iodized starch.
C: The addition of hydrochloric acid to a solution of Sodium Thiosulfate (1 in 10) produces a white precipitate.
Loss on drying—Weigh accurately about 1 Gm. of Sodium Thiosulfate, dry first at from 40° to 50°, then at 100° to constant weight: the loss in weight is not less than 32 per cent and not more than 37 per cent.
Arsenic—Add 3 cc. of nitric acid to 5 cc. of a solution of Sodium Thiosulfate (1 in 25), evaporate the solution cautiously to dryness on a water bath, treat the residue with a few cc. of water, filter the liquid, and evaporate the filtrate and washings to dryness: the residue meets the requirements of the test for *Arsenic*, page 618.

Calcium—A solution of Sodium Thiosulfate (1 in 20) is not rendered turbid by the addition of ammonium oxalate T.S.

Heavy metals—Dissolve 1 Gm. of Sodium Thiosulfate in 10 cc. of water. Slowly add 5 cc. of diluted hydrochloric acid, and evaporate the mixture to dryness on a steam bath. Gently boil the residue with 15 cc. of water for 2 minutes, and filter. Heat the filtrate to boiling, and add sufficient bromine T.S. to the hot filtrate to produce a clear solution and provide a slight excess of bromine. Boil the solution to expel the bromine completely, cool to room temperature, then add a drop of phenolphthalein T.S., and follow with sodium hydroxide T.S. until a slight pink color is produced. Add 2 cc. of diluted acetic acid and dilute with water to 25 cc.: the heavy metals limit, page 657, for Sodium Thiosulfate is 20 parts per million.

Assay—Weigh accurately about 500 mg. of the dried Sodium Thiosulfate obtained in the test for *Loss on drying*, dissolve it in 30 cc. of water, and titrate with tenth-normal iodine, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 15.81 mg. of $Na_2S_2O_3$.

Packaging and storage—Preserve Sodium Thiosulfate in tight, light-resistant containers.

AVERAGE DOSE—Oral or intravenous, **1 Gm.** (approximately 15 grains).

Solutions, continued

Spearmint

SPEARMINT

Mentha Viridis

Menth. Vir.

Spearmint consists of the dried leaf and flowering top of *Mentha spicata* Linné (*Mentha viridis* Linné) (Fam. *Labiatæ*).

Description —

Unground Spearmint—Leaves more or less crumpled, opposite, blade ovate-lanceolate, 3 to 7 cm. in length, apex acute or acuminate, base narrowed or rounded, margin unequally serrate, bright green in color, upper surface nearly glabrous, under surface with a few hairs on the veins and many amber-colored glandular hairs, nearly sessile or with a petiole less than 5 mm. in length; stems oppositely branched, quadrangular, 1 to 3 mm. in diameter, ridged, nearly glabrous and green, dusky red or purplish; verticillasters in opposite clusters and more or less interrupted or crowded, lanceolate, nearly acute spikes, 3 to 7 mm. in diameter, and in fruit becoming 9 cm. in length; bracts linear-lanceolate, subulate, ciliate, 7 to 10 mm. in length, some of them longer than the flowers, subtending the flower clusters; calyx campanulate, equally 5-toothed, glandular-punctate, pubescent on teeth, green to purplish red; corolla glabrous, nearly white or from moderate yellowish brown to weak yellowish orange, tubular-campanulate, its tube shorter than the calyx, its limb 4-cleft; stamens 4, equal; style 2-cleft at the summit; nutlets ellipsoidal, smooth, about 500 microns in diameter; odor aromatic, characteristic; taste slightly pungent, characteristic, but not followed by a cooling sensation in the mouth.

Powdered Spearmint—Green to olive green; closely resembling the powder of peppermint except for the absence of crystals from the globular heads of the glandular hairs and for the non-glandular hairs which are usually up to 6-celled.

Stems or other foreign organic matter—The amount of *stems* over 3 mm. in diameter, or other *Foreign Organic Matter*, in Spearmint does not exceed 2 per cent, pages 710 and 711.

Spearmint Oil

SPEARMINT OIL

Oleum Menthæ Viridis

Ol. Menth. Vir.

Spearmint Oil is the volatile oil distilled with steam from the fresh, over-ground parts of the flowering plant of *Mentha spicata* Linné (*Mentha*

viridis Linné) (Fam. *Labiatæ*). It yields not less than 50 per cent, by volume, of carvone ($C_{10}H_{14}O$).

Description—Spearmint Oil is a colorless, yellow or greenish yellow liquid, having the characteristic odor and taste of spearmint.
Solubility—Spearmint Oil is soluble in one volume of 80 per cent alcohol, forming a clear solution.
Specific gravity—The specific gravity of Spearmint Oil is not less than 0.917 and not more than 0.934.
Optical rotation—The optical rotation of Spearmint Oil is not less than −48° and not more than −59° in a 100-mm. tube, page 675.
Refractive index—The refractive index of Spearmint Oil is not less than 1.4840 and not more than 1.4910 at 20°, page 682.
Reaction—A solution of recently distilled Spearmint Oil in an equal volume of 80 per cent alcohol is neutral or only slightly acid to moistened litmus paper.
Assay—Place 10 cc. of Spearmint Oil, measured from a pipette, in a 100-cc. cassia flask, and add 50 cc. of a saturated solution of sodium sulfite, which has been carefully rendered neutral to 2 drops of phenolphthalein T.S. by means of a 30 per cent sodium bisulfite solution. Heat the mixture in a bath containing boiling water, and shake the flask repeatedly, neutralizing the mixture from time to time by the addition of a few drops of the 30 per cent sodium bisulfite solution. When no coloration appears upon the addition of a few more drops of phenolphthalein T.S. and heating for 15 minutes, cool to room temperature, and when the liquids have separated completely, add sufficient of the sodium sulfite solution to raise the lower limit of the oily layer within the graduated portion of the neck. The oily layer measures not more than 5 cc., indicating the presence in the Oil of not less than 50 per cent, by volume, of carvone ($C_{10}H_{14}O$).
Packaging and storage—Preserve Spearmint Oil in tight containers.

SPEARMINT SPIRIT

Spiritus Menthæ Viridis

Sp. Menth. Vir.

Spearmint Spirit contains, in each 100 cc., not less than 9 cc. and not more than 11 cc. of spearmint oil.

SPEARMINT OIL	100 cc.
SPEARMINT, in coarse powder	10 Gm.
ALCOHOL, a sufficient quantity,	
To make	1000 cc.

Macerate the spearmint leaves, freed as much as possible from stems and coarsely powdered, during 1 hour in 500 cc. of distilled water, and then strongly express them. Add the moist, macerated leaves to 900 cc. of alcohol, and allow the mixture to stand during 6 hours with frequent agitation. Filter, and to the filtrate add the oil and sufficient alcohol to make the product measure 1000 cc.

Assay—Proceed as directed under *Peppermint Spirit*, page 391.
Alcohol content—From 79 to 85 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Spearmint Spirit in tight containers, protected from light.

AVERAGE DOSE—1 cc. (approximately 15 minims).

Spearmint Water

SPEARMINT WATER

Aqua Menthæ Viridis

Aq. Menth. Vir.

Spearmint Water is a clear, saturated solution of spearmint oil in distilled water, prepared by one of the processes described under *Waters*, page 726.

Spermaceti

SPERMACETI

Cetaceum

Cetac.

Spermaceti is a waxy substance obtained from the head of the sperm whale, *Physeter macrocephalus* Linné (Fam. *Physeteridæ*).

Description—Spermaceti occurs in white, somewhat translucent, slightly unctuous masses, having a crystalline fracture, and a pearly luster. It has a very faint odor, a bland, mild taste, and is free from rancidity. Its specific gravity is about 0.94.
Solubility—Spermaceti is insoluble in water, nearly insoluble in cold alcohol, and only slightly soluble in cold petroleum benzin. It is soluble in boiling alcohol, in ether, in chloroform, and in fixed and volatile oils.
Melting range—Spermaceti melts between 42° and 50°, page 667.
Paraffin and free acids—Spermaceti dissolves completely in 50 parts of boiling alcohol and the solution is neutral or not more than slightly acid to moistened litmus paper.
Stearic acid—Warm a mixture of about 1 Gm. of Spermaceti and 10 cc. of ammonia T.S. in a stoppered container until the Spermaceti is melted. Shake the mixture thoroughly for a few minutes, cool, filter, and acidulate the filtrate with hydrochloric acid: the liquid may become turbid, but yields no precipitate.
Packaging and storage—Preserve Spermaceti in well-closed containers.

Spirits

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STARCH

Amylum

Corn Starch

Starch consists of the granules separated from the grain of *Zea Mays* Linné (Fam. *Gramineæ*).

Description—Starch occurs as irregular, angular, white masses or as a fine powder, and consists chiefly of polygonal, rounded, or spheroidal grains from 3 to 35 microns in diameter and usually with a circular or several-rayed central cleft. It is odorless, and has a slight, characteristic taste.

Solubility—Starch is insoluble in cold water and in alcohol.

Identification—

A: Prepare a smooth mixture of 1 Gm. of Starch with 2 cc. of cold water, stir the mixture into 15 cc. of boiling water, boil gently for 2 minutes, and cool the mixture: the product is a translucent, whitish jelly.

B: Starch is colored purplish blue to deep blue by iodine T.S.

Loss on drying—Starch loses not more than 14 per cent of its weight when dried at 120° for 4 hours.

Residue on ignition—Starch yields not more than 0.5 per cent of residue on ignition, page 685

Reaction—Triturate about 500 mg. of Starch with 5 cc. of water: the mixture is neutral to litmus paper.

Iron—Mix 10 cc. of water with 500 mg. of Starch, and add 0.5 cc. of hydrochloric acid and 3 drops of potassium ferrocyanide T.S.: the mixture does not become blue within 1 minute.

Packaging and storage—Preserve Starch in well-closed containers.

STARCH GLYCERITE

Glyceritum Amyli

Glycer. Amyl.

STARCH	100	Gm.
BENZOIC ACID	2	Gm.
DISTILLED WATER	200	cc.
GLYCERIN	700	cc.
To make about	1000	Gm.

Rub the starch and the benzoic acid with the distilled water in a porcelain dish until a smooth mixture is produced, then add the glycerin, and mix well. Heat the mixture on a sand bath to a temperature between 140° and 144°, with constant but gentle stirring until a translucent, jelly-like mass results, and then strain through muslin.

Starch Glycerite should be freshly prepared.

Packaging and storage—Preserve Starch Glycerite in tight containers.

Stearic Acid

STEARIC ACID

Acidum Stearicum

Acid. Stearic.

Stearic Acid is a mixture of solid acids obtained from fats, and consists chiefly of stearic acid [$HC_{18}H_{35}O_2$] and palmitic acid [$HC_{16}H_{31}O_2$].

Description—Stearic Acid is a hard, white or faintly yellowish, somewhat glossy and crystalline solid, or a white or yellowish white powder. The odor and taste are slight, suggesting tallow.

Solubility—Stearic Acid is almost insoluble in water. One Gm. of the Acid dissolves in about 20 cc. of alcohol, in 2 cc. of chloroform, and in about 3 cc. of ether.

Congealing temperature—Stearic Acid congeals at a temperature not below 54°, page 629.

Mineral acid—Shake 5 Gm. of melted Stearic Acid with an equal volume of hot water for 2 minutes, cool, and filter through a paper filter: the filtrate is not reddened by the addition of 1 drop of methyl orange T.S.

Neutral fat or paraffin—Add 1 Gm. of Stearic Acid and 500 mg. of monohydrated sodium carbonate to 30 cc. of water in a capacious flask, and boil the mixture: the resulting solution, while hot, is clear or, at most, opalescent.

Iodine value—The iodine value of Stearic Acid is not more than 4, page 647.

Packaging and storage—Preserve Stearic Acid in well-closed containers.

Stearyl Alcohol

STEARYL ALCOHOL

Alcohol Stearylicum

Alcohol Stearyl.

Stearyl Alcohol is a mixture of solid alcohols consisting chiefly of stearyl alcohol [$CH_3(CH_2)_{16}CH_2OH$].

Description—Stearyl Alcohol occurs as unctuous, white flakes or granules. It has a faint characteristic odor and a bland, mild taste.

Solubility—Stearyl Alcohol is insoluble in water. It is soluble in alcohol and in ether.

Melting range—Stearyl Alcohol melts between 56° and 60°, page 667.

Acid value—The acid value of Stearyl Alcohol is not more than 2, page 646.

Iodine value—The iodine value of Stearyl Alcohol is not more than 2, page 647.

Hydroxyl value—Place about 2 Gm. of Stearyl Alcohol, accurately weighed, in a dry, 250-cc. glass-stoppered flask and add 2 cc. of pyridine, followed by 10 cc. of toluene. To the mixture add exactly 10 cc. of a solution of acetyl chloride, prepared by mixing 10 cc. of acetyl chloride with 90 cc. of toluene; stopper the flask and immerse in a water bath heated to 60° to 65° for 20 minutes. Now add 25 cc. of water, again stopper the flask and shake it vigorously for several minutes to decompose the excess acetyl chloride. Titrate to a permanent pink end-point with normal sodium hydroxide, using 0.5 cc. of phenolphthalein T.S. as the indicator, shaking the flask vigorously toward the end of the titration to maintain the contents in an emulsified condition. Perform a blank test with the same quantities of the same reagents and in the same manner. The difference between the number of cc. of normal sodium hydroxide consumed in the test with the sample and that consumed in the blank test, multiplied by 56.1 and the result divided by the weight, in grams, of the Stearyl Alcohol used, represents the hydroxyl value of the Stearyl Alcohol, which is not less than 200 and not more than 220.

Packaging and storage—Preserve Stearyl Alcohol in well-closed containers.

Stomach, Powdered

POWDERED STOMACH

Stomachus Pulveratus

Stomach. Pulv.—Dried Stomach

Powdered Stomach is the dried and powdered defatted wall of the stomach of the hog, *Sus scrofa* Linné var. *domesticus* Gray (Fam. *Suidæ*). It contains factors which increase the number of red blood corpuscles in the blood of persons affected with pernicious anemia. The activity is readily destroyed when the preparation is suspended in a hot liquid. The approximate anti-anemia potency of Powdered Stomach in pernicious anemia is expressed in U. S. P. Units (oral). Powdered Stomach conforms to all other provisions outlined under *Anti-anemia Preparations*, page 617.

Packaging and storage—Preserve Powdered Stomach in tight containers, preferably in a cool place.

Labeling—Label Powdered Stomach to show the potency assigned to it by the U. S. P. Anti-Anemia Preparations Advisory Board.

AVERAGE DAILY DOSE—One U. S. P. Unit daily.

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Storax

STORAX
Styrax
Liquid Storax

Storax is a balsam obtained from the trunk of *Liquidambar orientalis* Miller, known in commerce as Levant Storax, or of *Liquidambar styraciflua* Linné, known in commerce as American Storax (Fam. *Hamamelidaceæ*).

Description—A semi-liquid, grayish to grayish brown, sticky, opaque mass, depositing on standing a heavy dark brown layer (Levant Storax); or a semi-solid, sometimes a solid mass, softened by gentle warming (American Storax). Storax is transparent in thin layers, has a characteristic odor and taste, and is more dense than water.

Solubility—Storax is insoluble in water, but soluble, usually incompletely, in an equal weight of warm alcohol. It is also soluble in acetone, in carbon disulfide, and in ether, some insoluble residue usually remaining.

Loss on drying—Dry about 2 Gm. of well-mixed Storax, accurately weighed, for 2 hours at 100°: it loses not more than 20 per cent of its weight.

Rosin or rosin oil—Triturate about 2 Gm. of Storax with 25 cc. of petroleum benzin in a small beaker for 5 minutes. Filter the mixture, and place 10 cc. of the filtrate in a dry test tube. Add 5 cc. of dilute sulfuric acid (made by mixing equal volumes of sulfuric acid and water and cooling the mixture), shake it vigorously, and allow to settle. Then add acetic anhydride, dropwise: no violet or purple band appears at the interface of the two liquids.

Alcohol-insoluble substances—Dissolve about 10 Gm. of well-mixed Storax, accurately weighed, in 100 cc. of hot alcohol, filter through counterbalanced filters or a tared Gooch crucible, and wash the residue with small portions of hot alcohol until the last washing is colorless or very nearly so: the weight of the residue after drying at 100° for 1 hour does not exceed 5 per cent of the weight of Storax taken for the test.

Alcohol-soluble substances—Evaporate the combined alcohol filtrate and washings obtained in the test for *Alcohol-insoluble substances* at a temperature not exceeding 60°, and dry the residue at 100° for 1 hour: a yellow to brown residue of purified Storax remains, corresponding to not less than 70 per cent of the weight of the Storax taken.

The purified Storax obtained in the test for Alcohol-soluble substances complies with the following tests:

Acid value—Dissolve about 1 Gm. of the purified Storax, accurately weighed, in 50 cc. of neutralized alcohol, add 0.5 cc. of phenolphthalein T.S., and titrate with half-normal sodium hydroxide: the acid value, page 646, is from 50 to 85 for Levant Storax and from 36 to 85 for American Storax.

Saponification value—Place about 2 Gm. of the purified Storax, accurately weighed, in a 250-cc. flask, mix it with 50 cc. of petroleum benzin, add 25 cc. of half-normal alcoholic potassium hydroxide, and allow the mixture to stand for 24 hours with frequent agitation. Then add 0.5 cc. of phenolphthalein T.S., and titrate the excess of alkali with half-normal hydrochloric acid: the saponification value thus determined is not less than 160 and not more than 200, page 647.

Cinnamic acid—Add about 2 Gm. of the purified Storax, accurately weighed, to 25 cc. of half-normal alcoholic potassium hydroxide, and boil the mixture for 1 hour under a reflux condenser. Neutralize with half-normal sulfuric acid, using 5 drops

of phenolphthalein T.S. as the indicator, and evaporate the alcohol on a water bath. Dissolve the residue in 50 cc. of water, and shake the solution with 20 cc. of ether. Shake the separated ether with 5 cc. of water, add the washings to the water solution, and reject the ether extract. Add to the water solution 10 cc. of diluted sulfuric acid, and shake with four successive portions of 20 cc. each of ether. Wash the combined ether extracts with 5 cc. of water, rejecting the water washings, transfer to a flask, and distil off the ether. Add to the residue 100 cc. of water, and boil the mixture vigorously for 15 minutes under a reflux condenser. Filter while hot, and allow the filtrate to cool to about 25°: white crystals of cinnamic acid separate. Collect the cinnamic acid in a Gooch crucible, finally using reduced pressure to drain the crystals completely. Repeat the extraction of the residue twice by boiling each time under a reflux condenser, as before described, with the filtrate from the preceding crystallization, and collect the additional cinnamic acid in the same crucible. Finally wash the cinnamic acid with two 10-cc. portions of ice-cold water, dry at 80°, and weigh. The weight of the cinnamic acid thus obtained is equivalent to not less than 25 per cent of the purified Storax taken.

To about 50.0 mg. of the cinnamic acid obtained above, add 5 cc. of diluted sulfuric acid, heat, and add potassium permanganate T.S.: the mixture evolves the odor of benzaldehyde. A portion of the acid recrystallized from hot water melts between 134° and 135°.

Stramonium

STRAMONIUM

Stramonium

Stramon.—Jimson Weed, Jamestown Weed

Stramonium consists of the dried leaf and flowering or fruiting tops with branches of *Datura Stramonium* Linné (including *Datura Tatula* Linné) (Fam. *Solanaceæ*).

Stramonium yields not less than 0.25 per cent of the alkaloids of Stramonium.

Description—

Unground Stramonium—More or less matted, wrinkled, and crushed; leaves petiolate, ovate, or triangular-ovate; apex acuminate, base unequal; margin sinuate, toothed, or angled, the teeth few, acute, and with rounded sinuses; the lamina usually shows small, circular perforations, surrounded by cork or sometimes filled with cork, surfaces usually sparsely hairy, the hairs mostly upon the veins; color of both upper and lower surfaces of lamina, grayish green to light olive brown to dusky olive green. Flowers solitary in the forks of the branches on a short pedicel; calyx green, 5-toothed; corolla white or purplish, plicate, funnel-shaped; stamens 5, epipetalous; pistil bicarpellate with a conical ovary covered with short, stiff emergences. Stems often flattened, longitudinally wrinkled, occasionally with one or more deep furrows; light olive brown to purplish brown. Odor distinct, heavy and narcotic; taste unpleasant and nauseous.

Histology—Leaf: Upper epidermis of thin-walled cells, with few stomata of solanaceous type and hairs; palisade, 1-layered, and resting upon a single row of small parenchyma cells extending through the middle of the blade, nearly every cell of the layer containing a rosette aggregate of calcium oxalate; spongy parenchyma loosely arranged; lower epidermis similar to the upper but more uneven

and with more stomata, the latter slightly elevated and with guard cells nearly circular in outline and distinctly beaked. Midrib convex above and below, exhibiting an upper and lower epidermis with thick-walled cells, directly beneath either of which is a zone of collenchyma, and in the center a meristele of bicollateral bundles surrounded by parenchyma, many cells of which contain either microcrystals or prisms of calcium oxalate.

Powdered Stramonium—Bright green, or light olive brown to dusky yellowish green; epidermal cells of lamina with wavy radial walls; stomata elliptical, about 25 microns in length, usually with 3 neighboring cells, one smaller than the others; calcium oxalate in rosette aggregates, from 10 to 25 microns in diameter, or in prisms; non-glandular hairs of leaf few, 2- to 6-celled, attaining a length of about 500 microns, the basal cell being usually more than 50 microns in length and from 35 to 40 microns in diameter at the base, some of the cells more or less collapsed, the outer walls with numerous slight centrifugal projections; glandular hairs, few, with 1- to 2-celled, usually curved stalks and 2- to 4-celled glandular heads; tracheæ annular or spiral. Stem fragments with epidermal hairs up to 800 microns in length, occasional pericyclic fibers, annular or spiral tracheæ or tracheæ with simple or bordered pores associated with wood parenchyma or wood-fibers; midrib fragments with long, narrow, unequally thickened collenchymatous cells associated with parenchyma cells, some of the latter containing sphenoidal microcrystals and prisms.

Stramonium stems—The amount of *stems* over 8 mm. in diameter in Stramonium does not exceed 3 per cent.

Acid-insoluble ash—Stramonium yields not more than 4 per cent of *Acid-insoluble ash*, pages 710 and 711.

Assay—Proceed as directed under the *Assay* for *Belladonna Leaf*, page 64, using 10 Gm. of Stramonium. Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of Stramonium.

Stramonium Extract

STRAMONIUM EXTRACT

Extractum Stramonii

Ext. Stramon.

Stramonium Extract yields, from each 100 Gm., not less than 0.90 Gm. and not more than 1.10 Gm. of the alkaloids of stramonium.

PILULAR STRAMONIUM EXTRACT

Prepare an extract by percolating 1000 Gm. of stramonium, in moderately coarse powder, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Macerate the drug during 16 hours, and then percolate it at a moderate rate. Evaporate the percolate to a pilular consistence under reduced pressure and at a temperature not exceeding 60°, and adjust the remaining extract, after assaying, by dilution with liquid glucose, so that the finished Extract will contain, in each 100 Gm., 1.00 Gm. of the alkaloids of stramonium.

Assay—Proceed as directed under the *Assay* for *Pilular Belladonna Extract*, page 63, using approximately 3 Gm. of Pilular Stramonium Extract, accurately weighed. Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of stramonium.

POWDERED STRAMONIUM EXTRACT

Prepare an extract by percolating 1000 Gm. of stramonium, in moderately coarse powder, using alcohol as the menstruum. Macerate the drug during 16 hours, and then percolate it slowly. Evaporate the percolate to a soft extract under reduced pressure and at a temperature not exceeding 60°, add 50 Gm. of dry starch, continue the evaporation, at the same temperature, until the product is dry, and powder the residue. The extract may be deprived of its fat by treating either the soft extract first obtained, or the dry and powdered extract, as directed under *Extracts*, page 643. Assay the powdered residue, and add sufficient starch, dried at 100°, to make the finished Extract contain, in each 100 Gm., 1.00 Gm. of the alkaloids of stramonium. Mix the powders thoroughly and pass the Extract through a fine sieve.

Assay—Proceed as directed under the *Assay* for *Powdered Belladonna Extract*, page 64, using approximately 3 Gm. of Powdered Stramonium Extract, accurately weighed. Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of stramonium.

Packaging and storage—Preserve Stramonium Extract in tight, light-resistant containers, preferably at a temperature not above 30°.

AVERAGE DOSE—**20 mg.** (approximately 1/3 grain).

Stramonium Tincture

STRAMONIUM TINCTURE

Tinctura Stramonii

Tr. Stramon.

Stramonium Tincture yields, from each 100 cc., not less than 22 mg. and not more than 28 mg. of the alkaloids of stramonium.

STRAMONIUM, in moderately coarse powder...........	100 Gm.
To make about.....................	1000 cc.

Prepare a tincture by Process P, as modified for assayed tinctures, page 708, using a mixture of 3 volumes of alcohol and 1 volume of water as the menstruum. Percolate the drug at a moderate rate. Finally adjust the Tincture to contain, in each 100 cc., 25 mg. of the alkaloids of stramonium.

Assay—Measure accurately 100 cc. of Stramonium Tincture and evaporate it, at a temperature not exceeding 100°, to a volume of about 10 cc. Complete the assay as directed under *Belladonna Tincture* page 66, beginning with the words, "Transfer the concentrated liquid to a separator." Each cc. of fiftieth-normal acid is equivalent to 5.787 mg. of the alkaloids of stramonium.

Packaging and storage—Preserve Stramonium Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.

Alcohol content—From 64 to 70 per cent, by volume, of C_2H_5OH.

AVERAGE DOSE—**0.75 cc.** (approximately 12 minims).

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Strychnine Sulfate

STRYCHNINE SULFATE

Strychninæ Sulfas

Strych. Sulf.

$(C_{21}H_{22}N_2O_2)_2.H_2SO_4.5H_2O$ Mol. wt. 856.96

Strychnine Sulfate is the sulfate of an alkaloid obtained chiefly from the ripe seed of *Strychnos Nux-vomica* Linné (Fam. *Loganiaceæ*).

Caution—Strychnine Sulfate is extremely poisonous.

Description—Strychnine Sulfate occurs as colorless or white crystals, or as a white, crystalline powder without odor. It is efflorescent in dry air. It is lævorotatory.

Solubility—One Gm. of Strychnine Sulfate dissolves in 35 cc. of water, in 85 cc. of alcohol, and in about 220 cc. of chloroform. One Gm. dissolves in 7 cc. of boiling water, and in 25 cc. of alcohol at 70°. It is freely soluble in glycerin but insoluble in ether.

Identification—

A: Add a fragment of potassium dichromate to a solution of 100 mg. of Strychnine Sulfate in 2 cc. of sulfuric acid. The mixture immediately assumes a deep blue color which changes to deep violet, then to purplish red, cherry red, and finally to orange or yellow.

B: Sulfuric Acid containing 1 per cent of ammonium vanadate produces with Strychnine Sulfate a deep violet blue color, which changes to a deep purple and finally to a cherry red.

C: A solution of Strychnine Sulfate (1 in 50) responds to the test for *Sulfate*, page 663.

Free acid—A solution of 500 mg. of Strychnine Sulfate in 20 cc. of water requires not more than 0.5 cc. of fiftieth-normal sodium hydroxide for neutralization, using 1 drop of methyl red T.S. as the indicator.

Loss on drying—When dried at 105° for 6 hours, Strychnine Sulfate loses not more than 11.5 per cent of its weight.

Residue on ignition—Strychnine Sulfate yields not more than 0.1 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 200 mg. of Strychnine Sulfate in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Brucine—Add 1 cc. of a mixture of equal volumes of nitric acid and water to about

100 mg. of Strychnine Sulfate: the mixture may be yellow, but not red or reddish in color.

Packaging and storage—Preserve Strychnine Sulfate in tight, light-resistant containers.

AVERAGE DOSE—**2 mg.** (approximately $\frac{1}{30}$ grain).

Strychnine Sulfate Tablets

STRYCHNINE SULFATE TABLETS

Tabellæ Strychninæ Sulfatis

Tab. Strych. Sulf.

Strychnine Sulfate Tablets contain not less than 93 per cent and not more than 107 per cent of the labeled amount of $(C_{21}H_{22}N_2O_2)_2.H_2SO_4.$-$5H_2O$ for tablets of 20 mg. or more; and not less than 90 per cent and not more than 110 per cent for tablets of less than 20 mg.

Identification—

A: Finely powder a number of the Tablets, equivalent to about 1 mg. of strychnine sulfate, and moisten thoroughly with ammonia T.S. Add 5 cc. of chloroform and triturate well for 5 minutes. Decant the chloroform through a small filter into an evaporating dish and evaporate to dryness on a steam bath. The residue responds to *Identification test B* under *Strychnine Sulfate*, page 520.

B: A filtered solution of Strychnine Sulfate Tablets responds to the test for *Sulfate*, page 663.

Assay—Weigh a counted number of not less than 50 Strychnine Sulfate Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 100 mg. of strychnine sulfate, and transfer it to a 100-cc. volumetric flask. Add 40 cc. of water and 50 cc. of diluted sulfuric acid, shake the mixture occasionally during 2 hours, and allow to stand over night. Dilute to 100 cc. with water, mix thoroughly, and filter through an asbestos pad in a Gooch crucible or a sintered glass crucible. Transfer to a separator an accurately measured portion of the filtrate, equivalent to about 50 mg. of strychnine sulfate, render the solution strongly alkaline with ammonia T.S., and completely extract the strychnine with successive 20-cc. portions of chloroform (at least six extractions will usually be required). Combine the chloroform extracts, and for each 50 cc. of the chloroform add 10 cc. of dehydrated alcohol, and evaporate the mixture to about 2 cc., but not to dryness. Add 5 cc. of reagent alcohol and exactly 25 cc. of fiftieth-normal sulfuric acid, and heat on a water bath until the odor of chloroform is no longer perceptible. Cool, and titrate the excess of acid with fiftieth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of fiftieth-normal sulfuric acid is equivalent to 8.57 mg. of $(C_{21}H_{22}N_2O_2)_2.$ $H_2SO_4.5H_2O$.

NOTE—This assay is applicable to uncoated Tablets. For coated Tablets a modification of this assay or another suitable assay method may be necessary.

Packaging and storage—Preserve Strychnine Sulfate Tablets in well-closed containers.

Sizes—Strychnine Sulfate Tablets usually available contain the following amounts of strychnine sulfate: 0.6, 1, 1.2, 1.5, and 2 mg. ($\frac{1}{100}$, $\frac{1}{60}$, $\frac{1}{50}$, $\frac{1}{40}$, and $\frac{1}{30}$ grain).

AVERAGE DOSE OF STRYCHNINE SULFATE—**2 mg.** (approximately $\frac{1}{30}$ grain).

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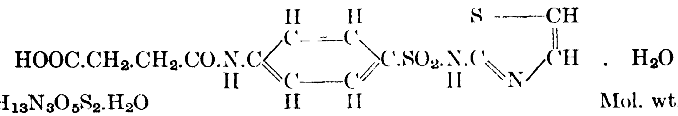
Succinylsulfathiazole

SUCCINYLSULFATHIAZOLE

Succinylsulfathiazolum

Succinylsulfathiazol.



$C_{13}H_{13}N_3O_5S_2.H_2O$ Mol. wt. 373.39

Succinylsulfathiazole, when dried at 100° for 18 hours, contains not less than 99 per cent of $C_{13}H_{13}N_3O_5S_2$.

Description—Succinylsulfathiazole occurs as a white or yellowish white, crystalline powder. It is odorless and is stable in air, but slowly darkens on exposure to light.

Solubility—One Gm. of Succinylsulfathiazole dissolves in about 4800 cc. of water. It is soluble in solutions of alkali hydroxides and in solutions of sodium bicarbonate with the evolution of carbon dioxide. It is sparingly soluble in alcohol and in acetone and is insoluble in chloroform and in ether.

Identification—

A: Add 5 cc. of diluted hydrochloric acid to 100 mg. of Succinylsulfathiazole, and boil gently for about 5 minutes. Cool in an ice bath, then add 4 cc. of a solution of sodium nitrite (1 in 100), dilute with water to 10 cc., and place the mixture in an ice bath for 10 minutes. To 5 cc. of the cooled mixture, add a solution of 50 mg. of betanaphthol in 2 cc. of a solution of sodium hydroxide (1 in 10): an orange-red precipitate is produced which darkens on standing.

B: Carefully heat about 50 mg. of Succinylsulfathiazole in a small test tube over an open flame until it melts. The fumes are pungent and discolor moistened lead acetate test paper.

C: Place about 100 mg. of Succinylsulfathiazole in a test tube, add 5 cc. of normal sodium hydroxide, and heat it in a bath of boiling water for 1 hour. Cool, dilute to 10 cc., and neutralize with diluted hydrochloric acid: a precipitate of plate-like crystals forms. Filter the mixture, wash the precipitate with water, and dry at 100°: the melting point of the sulfathiazole obtained is between 198° and 204°.

D: Gently boil 500 mg. of Succinylsulfathiazole with 10 cc. of diluted hydrochloric acid for 10 minutes, then evaporate to dryness on a steam bath. Treat the residue with 5 cc. of ammonia T.S., evaporate to dryness in a small dish, and dry at 100° for 30 minutes. Thoroughly mix the resulting residue with 2.5 Gm. of zinc powder, transfer the mixture to a test tube, and heat it gently over a free flame, while exposing to the escaping vapors a pine wood shaving previously well moistened with hydrochloric acid: the pine wood shaving becomes red to brownish red.

Acid—Digest 2 Gm. of Succinylsulfathiazole with 100 cc. of water at about 70° for 5 minutes, cool at once to about 20°, and filter. To 25 cc. of the filtrate add 2 drops of phenolphthalein T.S. and titrate with tenth-normal sodium hydroxide: not more than 1.0 cc. of the sodium hydroxide is required to produce a pink color.

Loss on drying—When dried at 100° for 18 hours, Succinylsulfathiazole loses not more than 7 per cent of its weight.

Residue on ignition—Succinylsulfathiazole yields not more than 0.1 per cent of residue on ignition, page 685.

Clarity and color of solution—A solution of 1 Gm. of Succinylsulfathiazole in a mixture of 20 cc. of water and 5 cc. of sodium hydroxide T.S. is clear and not more than slightly yellow.

Chloride—A 25-cc. portion of the filtrate prepared in the test for *Acid* shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—Another 25-cc. portion of the filtrate prepared in the test for *Acid* shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Dissolve 500 mg. of Succinylsulfathiazole in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of water, and add to the solution 5 drops of sodium sulfide T.S. If the solution darkens, its color is not more intense than that produced in a control made with the same reagents and to which 1 cc. of standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Succinylsulfathiazole, previously dried at 100° for 18 hours, and dissolve it in 10 cc. of 20 per cent sodium hydroxide solution. Digest the mixture in a steam bath for 2 hours, cool, and dilute to about 25 cc. with water. After neutralizing the mixture with hydrochloric acid, add an excess of 5 cc. of hydrochloric acid. Cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch-iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 35.54 mg. of $C_{13}H_{13}N_3O_5S_2$.

Packaging and storage—Preserve Succinylsulfathiazole in well-closed, light-resistant containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

Succinylsulfathiazole Tablets

SUCCINYLSULFATHIAZOLE TABLETS

Tabellæ Succinylsulfathiazoli

Tab. Succinylsulfathiazol.

Succinylsulfathiazole Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_{13}H_{13}N_3O_5S_2.H_2O$.

Identification—

A: Place a quantity of powdered Succinylsulfathiazole Tablets, equivalent to about 300 mg. of succinylsulfathiazole, in a test tube, add 10 cc. of sodium hydroxide T.S., and heat on a steam bath for 1 hour. Cool, dilute with water to 15 cc., filter, and neutralize the filtrate with diluted hydrochloric acid: a white precipitate of sulfathiazole is formed. Filter the precipitate, wash it well with cold water, and dry at 100°: the sulfathiazole thus obtained melts between 198° and 204°.

B: To a quantity of powdered Succinylsulfathiazole Tablets, equivalent to 500 mg. of succinylsulfathiazole, add 10 cc. of diluted hydrochloric acid, boil the mixture gently for 10 minutes, then evaporate to dryness on a steam bath. Treat the residue with 5 cc. of ammonia T.S., evaporate to dryness in a small dish, and dry at 100° for 30 minutes. Thoroughly mix the resulting residue with 2.5 Gm. of zinc powder, transfer the mixture to a test tube, and heat it gently over a free flame while exposing to the escaping vapors a

pine wood shaving previously well moistened with hydrochloric acid: the pine wood shaving becomes red to brownish red.

Assay—Weigh a counted number of not less than 20 Succinylsulfathiazole Tablets and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 500 mg. of succinylsulfathiazole, add to it 10 cc. of 20 per cent sodium hydroxide solution, and digest the mixture on a steam bath for 2 hours. Cool, dilute with water to about 25 cc., neutralize with hydrochloric acid, and add 5 cc. excess of the hydrochloric acid. Cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch-iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 37.34 mg. of $C_{13}H_{13}N_3O_5S_2.H_2O$.

Packaging and storage—Preserve Succinylsulfathiazole Tablets in well-closed, light-resistant containers.

Sizes—Succinylsulfathiazole Tablets usually available contain the following amounts of succinylsulfathiazole: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DOSE OF SUCCINYLSULFATHIAZOLE—2 Gm. (approximately 30 grains).

Sucrose

SUCROSE

Sucrosum

Sucros.—Saccharum, Sugar

$C_{12}H_{22}O_{11}$

$$
\begin{array}{c}
\overbrace{CH_2OH.CH.(CHOH)_3.CH}^{O} \\
O \\
\underbrace{CH_2OH.CH.(CHOH)_2.C.CH_2OH}_{O}
\end{array}
$$

Mol. wt. 342 30

Sucrose is a sugar obtained from *Saccharum officinarum* Linné (Fam. *Gramineæ*), *Beta vulgaris* Linné (Fam. *Chenopodiaceæ*), and other sources.

Description—Sucrose occurs as colorless or white crystals, crystalline masses or blocks, or as a white, crystalline powder. It is odorless, has a sweet taste, and is stable in air. Its solutions are neutral to litmus paper.

Solubility—One Gm. of Sucrose dissolves in 0.5 cc. of water and in 170 cc. of alcohol. It dissolves in slightly more than 0.2 cc. of boiling water, and is insoluble in chloroform and in ether.

Specific rotation—The specific rotation, $[\alpha]_D^{20°}$, of Sucrose in a solution containing, in each 100 cc., 26 Gm. of Sucrose, previously dried to constant weight at 105°, and using a 200-mm. tube, is not less than +65.9°, page 675.

Residue on ignition—Sucrose yields not more than 0.05 per cent of residue on ignition, page 685.

Chloride—A 10-cc. portion of a solution of Sucrose (1 in 10) remains clear for at least 1 minute after the addition of 1 cc. of silver nitrate T.S.

Sulfate—A 5-Gm. portion of Sucrose shows no more *Sulfate* than corresponds to 0.3 cc. of fiftieth-normal sulfuric acid, page 709.

Calcium—A 10-cc. portion of a solution of Sucrose (1 in 10) remains clear for at least 1 minute after the addition of 1 cc. of ammonium oxalate T.S.

Heavy metals—Dissolve 3 Gm. of Sucrose in 15 cc. of water, add 1 cc. of tenth-normal hydrochloric acid, and dilute to 25 cc. with water: the heavy metals limit, page 657, for Sucrose is 5 parts per million.

Insoluble salts, ultramarine or Prussian blue—A solution of Sucrose (1 in 1) is colorless or at most appears only faintly yellow when viewed transversely against a white background, in a cylinder of colorless glass, having an inside diameter of about 25 mm. When kept in large, well-closed, and completely filled bottles, the solution deposits no sediment on prolonged standing.

Invert sugar—Dissolve 20 Gm. of Sucrose in enough water to make 100 cc. of solution, and filter if necessary. To 50 cc. of the clear liquid contained in a 250-cc. beaker, add 50 cc. of alkaline cupric tartrate T.S., cover the beaker with a watch glass, heat the mixture at such a rate that it requires approximately 4 minutes to bring it to the boiling point, and boil for exactly 2 minutes. Add at once 100 cc. of cold, recently boiled water, and immediately collect and weigh the precipitated cuprous oxide in the following manner: Prepare a Gooch crucible with an asbestos layer. Thoroughly wash the asbestos with hot water, followed successively by 10 cc. of alcohol and 10 cc. of ether, dry at 100° for 30 minutes, and weigh the prepared crucible. Filter the precipitated cuprous oxide through the crucible thus prepared, thoroughly wash the residue on the filter with hot water, then with 10 cc. of alcohol, and finally with 10 cc. of ether, and dry at 100° for 30 minutes. The weight of the cuprous oxide does not exceed 112 mg., corresponding to not more than 0.3 per cent of invert sugar.

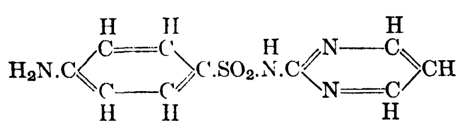
Packaging and storage—Preserve Sucrose in well-closed containers.

Sulfadiazine

SULFADIAZINE

Sulfadiazinum

Sulfadiazin.



$C_{10}H_{10}N_4O_2S$ Mol. wt. 250.27

Sulfadiazine, when dried at 100° for 4 hours, contains not less than 99 per cent of $C_{10}H_{10}N_4O_2S$.

Description—Sulfadiazine occurs as a white or slightly yellow powder. It is odorless or nearly so, and is stable in air, but slowly darkens on exposure to light.

Solubility—One Gm. of Sulfadiazine dissolves in about 13,000 cc. of water and is sparingly soluble in alcohol and in acetone. One Gm. of Sulfadiazine dissolves in about 620 cc. of human serum at 37°. It is freely soluble in dilute mineral acids and in solutions of potassium and sodium hydroxides and in ammonia T.S.

Melting range—Sulfadiazine melts between 252° and 256°, page 667.

Identification—

A: Carefully heat about 50 mg. of Sulfadiazine in a small test tube over an open flame or in a sand bath until it melts: a reddish brown color develops. The fumes evolved during the decomposition do not discolor moistened lead acetate test paper (distinction from *sulfathiazole*).

B: Gently heat about 1 Gm. of Sulfadiazine in a small test tube over a small flame until a sublimate is formed. Collect a few mg. of the sublimate with a glass rod and mix it in a test tube with 1 cc. of an alcohol solution of resorcinol (1 in 20). Then add 1 cc. of sulfuric acid, and mix by shaking; a deep red color appears at once. Cautiously dilute the mixture with 25 cc. of ice-cold water and add an excess of ammonia T.S.: a blue or reddish blue color is produced.

Clarity and color of solution—A solution of 1 Gm. of Sulfadiazine in 20 cc. of water and 5 cc. of sodium hydroxide T.S. is clear and not more than pale yellow.

Acid—Digest 1.5 Gm. of Sulfadiazine with 75 cc. of water at about 70° for 5 minutes. Cool at once to room temperature, and filter. To 25 cc. of the filtrate add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide: not more than 0.2 cc. of tenth-normal sodium hydroxide is required to produce a pink color.

Loss on drying—When dried at 100° for 4 hours, Sulfadiazine loses not more than 0.5 per cent of its weight.

Residue on ignition—Sulfadiazine yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—Dissolve 500 mg. of Sulfadiazine in a mixture of 5 cc. of nitric acid and 15 cc. of water: the solution shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 25-cc. portion of the filtrate obtained in the test for *Acid* shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Dissolve 500 mg. of Sulfadiazine in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of water, and add to the solution 5 drops of sodium sulfide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfadiazine, previously dried at 100° for 4 hours, and transfer to a beaker or casserole. Add 20 cc. of hydrochloric acid and 50 cc. of water, cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 25.03 mg. of $C_{10}H_{10}N_4O_2S$.

Packaging and storage—Preserve Sulfadiazine in well-closed, light-resistant containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

Sulfadiazine Tablets

SULFADIAZINE TABLETS

Tabellæ Sulfadiazini

Tab. Sulfadiazin.

Sulfadiazine Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_{10}H_{10}N_4O_2S$.

Identification—Triturate a quantity of finely powdered Sulfadiazine Tablets, equivalent to about 500 mg. of sulfadiazine, with 5 cc. of chloroform, and transfer to a small filter. Wash with another 5-cc. portion of chloroform and discard the filtrate. Triturate the residue with 10 cc. of ammonia T.S. for 5 minutes, add 10 cc. of water, and filter. Warm the filtrate until most of the ammonia is expelled, cool, and add acetic acid to a distinctly acid reaction: a precipitate of sulfadiazine is formed. Collect the precipitate on a filter, wash it well with cold water and dry at about 100°. The sulfadiazine so obtained melts between 252° and 256°, page 667, and responds to *Identification tests A* and *B* under *Sulfadiazine*, page 525.

Assay—Weigh a counted number of not less than 20 Sulfadiazine Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 500 mg. of sulfadiazine, and transfer it to a beaker or casserole. Add 20 cc. of hydrochloric acid and 50 cc. of water, warm on a steam bath until dissolved, cool to about 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped in the solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 25.03 mg. of $C_{10}H_{10}N_4O_2S$.

Packaging and storage—Preserve Sulfadiazine Tablets in well-closed, light-resistant containers.

Sizes—Sulfadiazine Tablets usually available contain the following amounts of sulfadiazine: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DOSE OF SULFADIAZINE—2 Gm. (approximately 30 grains).

Sulfadiazine Sodium

SULFADIAZINE SODIUM

Sulfadiazinum Sodicum

Sulfadiazin. Sod.—Soluble Sulfadiazine

$C_{10}H_9N_4O_2SNa$ Mol. wt. 272.26

Sulfadiazine Sodium, when dried at 105° for 4 hours, contains not less than 99 per cent of $C_{10}H_9N_4O_2SNa$.

Description—Sulfadiazine Sodium occurs as a white powder. On prolonged exposure to humid air, it absorbs carbon dioxide with the liberation of sulfadiazine and becomes incompletely soluble in water. Its solutions are alkaline to phenolphthalein. It is affected by light.

Solubility—One Gm. of Sulfadiazine Sodium dissolves in about 2 cc. of water. It is only slightly soluble in alcohol.

Identification—
A: Dissolve about 1 Gm. of Sulfadiazine Sodium in 25 cc. of water, and add 2 cc. of acetic acid: a white precipitate of sulfadiazine is formed. Collect the precipitate on a filter, wash it well with cold water, and dry at 100° for 4 hours: the sulfadiazine so obtained melts between 252° and 256°, page 667, and responds to *Identification tests A* and *B*, under *Sulfadiazine*, page 525.
B: Ignite about 500 mg. of Sulfadiazine Sodium: the residue responds to the tests for *Sodium*, page 663.

Loss on drying—When dried at 105° for 4 hours, Sulfadiazine Sodium loses not more than 0.5 per cent of its weight.

Heavy metals—Dissolve 500 mg. of Sulfadiazine Sodium in 25 cc. of water, and add 5 drops of sodium sulfide T.S. If a dark color is produced, it is not darker than that produced in a control to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfadiazine Sodium, previously dried at 105° for 4 hours, transfer to a beaker or casserole, and proceed with the *Assay* as directed under *Sulfadiazine*, page 525, beginning with the words "Add 20 cc. of hydrochloric acid, etc." Each cc. of tenth-molar sodium nitrite is equivalent to 27.23 mg. of $C_{10}H_9N_4O_2SNa$.

Packaging and storage—Preserve Sulfadiazine Sodium in tight, light-resistant containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

Sulfadiazine Sodium, Sterile

STERILE SULFADIAZINE SODIUM

Sulfadiazinum Sodicum Sterile

Sulfadiazin. Sod. Steril.

Sterile Sulfadiazine Sodium, when dried at 105° for 4 hours, contains not less than 99 per cent of $C_{10}H_9N_4O_2SNa$, and meets the requirements of the *Sterility Tests for Solids*, page 689.

Sterile Sulfadiazine Sodium conforms to the *Description* and meets the *Identification tests* and other requirements under *Sulfadiazine Sodium*, page 527.

Completeness of solution—Place 5 Gm. of Sterile Sulfadiazine Sodium in a glass-stoppered, 25-cc. cylinder, nearly fill the cylinder with carbon dioxide-free water and shake gently until dissolved: the solution is clear.

Assay—Proceed as directed under the *Assay* for *Sulfadiazine Sodium*, page 527. Each cc. of tenth-molar sodium nitrite is equivalent to 27.23 mg. of $C_{10}H_9N_4O_2SNa$.

Packaging and storage—Preserve Sterile Sulfadiazine Sodium in tight containers so closed that the sterility of the product is maintained until the package is opened for use. Each package contains not more than 10 Gm. of Sterile Sulfadiazine Sodium. The container may be of such size as to permit solution within the container.

Labeling—The quantity of Sterile Sulfadiazine Sodium and the lot number must be stated on the label of each package.

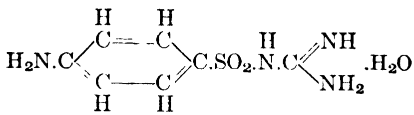
AVERAGE DOSE—Intravenous, 2 Gm. (approximately 30 grains).

Sulfaguanidine

SULFAGUANIDINE

Sulfaguanidinum

Sulfaguanidin.



$C_7H_{10}N_4O_2S.H_2O$ Mol. wt. 232.26

Sulfaguanidine, when dried at 110° for 4 hours, contains not less than 99 per cent of $C_7H_{10}N_4O_2S$.

Description—Sulfaguanidine occurs as a white, needle-like, crystalline powder. It is odorless or nearly so, and is stable in air, but slowly darkens on exposure to light.

Solubility—One Gm. of Sulfaguanidine dissolves in about 1000 cc. of water at 25° and in about 10 cc. at 100°. It is sparingly soluble in alcohol and in acetone. It is freely soluble in dilute mineral acids but insoluble in solutions of sodium hydroxide at room temperature.

Melting range—When dried at 110° for 4 hours, Sulfaguanidine melts between 190° and 193°, page 667.

Identification—Add 5 cc. of a solution of sodium hydroxide (1 in 5) to about 200 mg. of Sulfaguanidine: the Sulfaguanidine does not dissolve, but, when heated to boiling, it dissolves and an odor of ammonia is evolved. (*Sulfanilamide*, *sulfathiazole*, and *sulfadiazine* dissolve in cold sodium hydroxide solution, and do not evolve ammonia when boiled.)

Clarity and color of solution—A solution of 1 Gm. of Sulfaguanidine in a mixture of 5 cc. of hydrochloric acid and 5 cc. of water is clear and not more than faintly yellow.

Acid—Digest 1.5 Gm. of Sulfaguanidine with 75 cc. of water at about 70° for 5 minutes. Cool at once to room temperature and filter. To 25 cc. of the filtrate add 2 drops of phenolphthalein T.S., and follow with 0.1 cc. of tenth-normal sodium hydroxide: a pink color is produced.

Loss on drying—When dried at 110° for 4 hours, Sulfaguanidine loses not less than 6 per cent and not more than 8 per cent of its weight.

Residue on ignition—Sulfaguanidine yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—Dissolve 500 mg. of Sulfaguanidine in a mixture of 5 cc. of nitric acid and 15 cc. of water: the solution shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 25-cc. portion of the filtrate obtained in the test for *Acid* shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Dissolve 500 mg. of Sulfaguanidine by warming with a mixture of 4 cc. of normal hydrochloric acid and about 5 cc. of water. Cool, dilute with water

to 25 cc.: the heavy metals limit, page 657, for Sulfaguanidine is 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfaguanidine, previously dried at 110° for 4 hours, and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of water, cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite, stirring vigorously, until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 21.42 mg. of $C_7H_{10}N_4O_2S$.

Packaging and storage—Preserve Sulfaguanidine in well-closed, light-resistant containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

Sulfaguanidine Tablets

SULFAGUANIDINE TABLETS

Tabellæ Sulfaguanidini

Tab. Sulfaguanidin.

Sulfaguanidine Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_7H_{10}N_4O_2S.H_2O$.

Identification—Triturate a quantity of finely powdered Sulfaguanidine Tablets, equivalent to about 500 mg. of sulfaguanidine, with 5 cc. of chloroform, and transfer to a small filter. Wash with another 5-cc. portion of chloroform, and discard the filtrate. Triturate the residue with 10 cc. of diluted hydrochloric acid, add 5 cc. of water, and filter. Add to the filtrate a solution of 3 Gm. of ammonium acetate in 3 cc. of water, and allow to stand in a cold place for 30 minutes: a precipitate of sulfaguanidine is formed. Collect the precipitate on a filter, wash it well with cold water, and dry at about 110°. The sulfaguanidine so obtained melts between 190° and 193°, page 667, and responds to the *Identification test* under *Sulfaguanidine*, page 529.

Assay—Weigh a counted number of not less than 20 Sulfaguanidine Tablets and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 500 mg. of sulfaguanidine, and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of water. Cool to about 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped in the solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 23.23 mg. of $C_7H_{10}N_4O_2S.H_2O$.

Packaging and storage—Preserve Sulfaguanidine Tablets in well-closed, light-resistant containers.

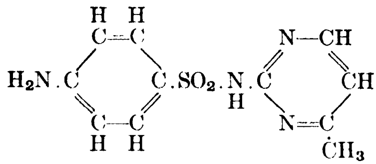
Sizes—Sulfaguanidine Tablets usually available contain the following amounts of sulfaguanidine: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DOSE OF SULFAGUANIDINE—**2 Gm.** (approximately 30 grains).

SULFAMERAZINE

Sulfamerazinum

Sulfameraz.



$C_{11}H_{12}N_4O_2S$ Mol. wt. 264.30

Sulfamerazine, when dried at 100° for 4 hours, contains not less than 99 per cent of $C_{11}H_{12}N_4O_2S$.

Description—Sulfamerazine occurs as white or faintly yellowish white crystals or powder. It has a slightly bitter taste and is odorless or nearly so. It is stable in air, but slowly darkens on exposure to light.

Solubility—One Gm. of Sulfamerazine dissolves in about 6250 cc. of water at 20° and in about 3300 cc. at 37°. It is readily soluble in dilute mineral acids and in solutions of potassium, ammonium, and sodium hydroxides. It is sparingly soluble in acetone, slightly soluble in alcohol, and very slightly soluble in ether and in chloroform.

Melting range—Sulfamerazine melts between 234° and 238°, page 667.

Identification—

A: To about 20 mg. of Sulfamerazine suspended in 5 cc. of water, add, dropwise, sodium hydroxide T.S. until dissolved, then add 2 or 3 drops of cupric sulfate T.S.: an olive green precipitate forms which becomes dark gray on standing.

B: Place about 500 mg. of Sulfamerazine in a test tube, wrap the upper portion of the test tube with wet filter paper, and heat the tube in a bath at a temperature of 240° to 280°, until a white crystalline sublimate forms in the neck of the tube. The vapors evolved during sublimation darken moistened lead acetate test paper. The melting range of the crystalline sublimate is between 153° and 157°, page 667.

Clarity and color of solution—A solution of 1 Gm. of Sulfamerazine in 20 cc. of water and 5 cc. of sodium hydroxide T.S. is clear and not more than pale yellow.

Acid—Digest 2 Gm. of Sulfamerazine with 100 cc. of water at about 70° for 5 minutes, cool at once to about 20°, and filter. To 25 cc. of the filtrate add 2 drops of phenolphthalein T S. and titrate with tenth-normal sodium hydroxide: not more than 0.5 cc. of the sodium hydroxide is required to produce a pink color.

Loss on drying—When dried at 100° for 4 hours, Sulfamerazine loses not more than 0.5 per cent of its weight.

Residue on ignition—Sulfamerazine yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—A 25-cc. portion of the filtrate prepared in the test for *Acid* shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 25-cc. portion of the filtrate prepared in the test for *Acid* shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Dissolve 500 mg. of Sulfamerazine in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of water, and add to the solution 5 drops of sodium sulfide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard

lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfamerazine, previously dried at 100° for 4 hours, and transfer it to a beaker or casserole. Add 50 cc. of water and 5 cc. of hydrochloric acid, stir until dissolved, cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite, stirring vigorously, until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 26.43 mg. of $C_{11}H_{12}N_4O_2S$.

Packaging and storage—Preserve Sulfamerazine in well-closed, light-resistant containers.

AVERAGE DOSE—2 Gm. (approximately 30 grains).

Sulfamerazine Tablets

SULFAMERAZINE TABLETS

Tabellæ Sulfamerazini

Tab. Sulfameraz.

Sulfamerazine Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_{11}H_{12}N_4O_2S$.

Identification—Triturate a quantity of finely powdered Sulfamerazine Tablets, equivalent to about 500 mg. of sulfamerazine, with two 5-cc. portions of chloroform, and discard the chloroform. Triturate the residue with 10 cc. of sodium hydroxide T.S. for 5 minutes, then add 10 cc. of water, and filter. Add to the filtrate, with stirring, acetic acid to a distinct acid reaction: a white precipitate is formed. Collect the precipitate on a filter, wash it well with cold water and dry at 100°. The sulfamerazine so obtained melts between 233° and 238°, page 667, and responds to *Identification tests A* and *B* under *Sulfamerazine*, page 531.

Assay—Weigh a counted number of not less than 20 Sulfamerazine Tablets and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 500 mg. of sulfamerazine, transfer it to a beaker or casserole, and add 5 cc. of hydrochloric acid and 50 cc. of water. Cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced in a few seconds, when a glass rod, dipped into the solution, is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 26.43 mg. of $C_{11}H_{12}N_4O_2S$.

Packaging and storage—Preserve Sulfamerazine Tablets in well-closed containers.

Sizes—Sulfamerazine Tablets usually available contain the following amount of sulfamerazine: 0.5 Gm. (7½ grains).

AVERAGE DOSE OF SULFAMERAZINE—2 Gm. (approximately 30 grains).

SULFAMERAZINE SODIUM

Sulfamerazinum Sodicum

Sulfameraz. Sod.—Soluble Sulfamerazine

$C_{11}H_{11}N_4O_2SNa$ Mol. wt. 286.29

Sulfamerazine Sodium, when dried at 105° for 4 hours, contains not less than 99 per cent of $C_{11}H_{11}N_4O_2SNa$.

Description—Sulfamerazine Sodium occurs as white or faintly yellowish white crystals or a crystalline powder which slowly darkens on exposure to light. It is odorless or nearly so and has a bitter taste. On prolonged exposure to humid air, it absorbs carbon dioxide with the liberation of Sulfamerazine and becomes incompletely soluble in water. Its solutions are alkaline to phenolphthalein T.S.

Solubility—One Gm. of Sulfamerazine Sodium dissolves in about 3 cc. of water. It is slightly soluble in alcohol, and is insoluble in ether and in chloroform.

Identification—

A: Dissolve about 1 Gm. of Sulfamerazine Sodium in 25 cc. of water and add 2 cc. of acetic acid. A white precipitate of sulfamerazine is formed. Collect the precipitate on a filter, wash it well with cold water, and dry at 100° for 4 hours. The Sulfamerazine so obtained melts between 234° and 238°, and responds to *Identification tests A* and *B* under *Sulfamerazine*, page 531.

B: Ignite about 500 mg. of Sulfamerazine Sodium: the residue responds to the tests for *Sodium*, page 663.

Loss on drying—When dried at 105° for 4 hours, Sulfamerazine Sodium loses not more than 2.5 per cent of its weight. Sulfamerazine Sodium monohydrate loses not more than 7.0 per cent of its weight.

Heavy metals—Dissolve 500 mg. of Sulfamerazine Sodium in 25 cc. of water and add 5 drops of sodium sulfide T.S. If a dark color is produced, it is not darker than that produced in a control to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfamerazine Sodium, previously dried at 105° for 4 hours, transfer to a beaker or casserole, and proceed with the assay as directed under *Sulfamerazine*, page 531, beginning with the words "Add 50 cc. of water." Each cc. of tenth-molar sodium nitrite is equivalent to 28.63 mg. of $C_{11}H_{11}N_4O_2SNa$.

Packaging and storage—Preserve Sulfamerazine Sodium in tight, light-resistant containers.

Labeling—Sulfamerazine Sodium containing 1 molecule of water shall be so labeled.

STERILE SULFAMERAZINE SODIUM

Sulfamerazinum Sodicum Sterile

Sulfameraz. Sod. Ster.

Sterile Sulfamerazine Sodium, when dried at 105° for 4 hours, contains not less than 99 per cent of $C_{11}H_{11}N_4O_2SNa$. It meets the requirements of the *Sterility Test for Solids*, page 689.

Sterile Sulfamerazine Sodium conforms to the *Description* and meets the *Identification tests* and other requirements under *Sulfamerazine Sodium*, page 533.

Completeness of solution—Place 5 Gm. of Sterile Sulfamerazine Sodium in a glass-stoppered 25-cc. cylinder, nearly fill the cylinder with carbon dioxide-free water and shake gently until dissolved: the solution is clear.

Assay—Proceed as directed under the *Assay* for *Sulfamerazine Sodium*, page 533. Each cc. of tenth-molar sodium nitrite is equivalent to 28.63 mg. of $C_{11}H_{11}N_4O_2$-SNa.

Packaging and storage—Preserve Sterile Sulfamerazine Sodium in tight, light-resistant containers so closed that the sterility of the product is maintained until the package is opened for use. Each package contains not more than 10 Gm. of Sterile Sulfamerazine Sodium. The container may be of such size as to permit solution within the container.

Labeling—The quantity of Sterile Sulfamerazine Sodium and the lot number must be stated on the label of each package.

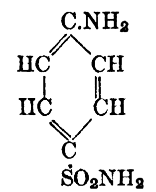
AVERAGE DOSE—Intravenous, **2 Gm.** (approximately 30 grains).

Sulfanilamide

SULFANILAMIDE

Sulfanilamidum

Sulfanilamid.



$C_6H_8N_2O_2S$ Mol. wt. 172.20

Sulfanilamide, when dried at 100° for 4 hours, contains not less than 99 per cent of $C_6H_8N_2O_2S$.

Description—Sulfanilamide occurs as white crystals, granules, or powder. It is odorless and is affected by light.

Solubility—One Gm. of Sulfanilamide dissolves in about 125 cc. of water, in about 37 cc. of alcohol, and in about 5 cc. of acetone. It is also soluble in glycerin, in hydrochloric acid, and in solutions of potassium and sodium hydroxides. It is very soluble in boiling water. It is insoluble in chloroform, in ether, and in benzene.

Melting range—Sulfanilamide melts between 164.5° and 166.5°, page 667.

Identification—

A: Add 5 cc. of diluted hydrochloric acid to about 100 mg. of Sulfanilamide, and boil gently for about 5 minutes. Cool in an ice bath, then add 4 cc. of a solution of sodium nitrite (1 in 100), dilute with water to 10 cc., and place the mixture in an ice bath for 10 minutes. To 5 cc. of the cooled mixture add a solution of 50 mg. of betanaphthol in 2 cc. of a solution of sodium hydroxide (1 in 10): an orange precipitate is produced.

B: Carefully heat about 50 mg. of Sulfanilamide in a small test tube over an open flame until it melts: an intense violet blue color develops. On further heating, the odors of ammonia and of aniline are evolved.

Loss on drying—Dry about 1 Gm. of Sulfanilamide, accurately weighed, at 100° for 4 hours: it loses not more than 0.5 per cent of its weight.

Acid—Dissolve 1.5 Gm. of Sulfanilamide in 75 cc. of hot water, cool at once to about 20°, dilute with water to 75 cc., and filter: the filtrate is neutral to litmus paper.

Residue on ignition—Sulfanilamide yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—A 25-cc. portion of the filtrate prepared for the test for *Acid* shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A 25-cc. portion of the filtrate prepared for the test for *Acid* shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Dissolve 500 mg. of Sulfanilamide in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of water, and add to the solution 5 drops of sodium sulfide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfanilamide, previously dried for 4 hours at 100°, and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of water, stir until dissolved, cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite, stirring vigorously, until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 17.22 mg. of $C_6H_8N_2O_2S$.

Packaging and storage—Preserve Sulfanilamide in well-closed, light-resistant containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

Sulfanilamide Tablets

SULFANILAMIDE TABLETS

Tabellæ Sulfanilamidi

Tab. Sulfanilamid.

Sulfanilamide Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_6H_8N_2O_2S$.

Identification—Triturate a quantity of finely powdered Sulfanilamide Tablets, equivalent to about 500 mg. of sulfanilamide, with 10 cc., then with 5 cc. of chloroform, and discard the chloroform. Macerate the residue with 15 cc. of acetone, filter, evaporate the filtrate on a steam bath with the aid of a current of air, and dry the residue at about 80°. The sulfanilamide so obtained melts between 164.5° and 166.5°, page 667, and responds to the *Identification tests* under *Sulfanilamide*, page 534.

Assay—Weigh a counted number of not less than 20 Sulfanilamide Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion

of the powder, equivalent to about 500 mg. of sulfanilamide, and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of water. Cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped in the titrated solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 17.22 mg. of $C_6H_8N_2O_2S$.

Packaging and storage—Preserve Sulfanilamide Tablets in well-closed containers.

Sizes—Sulfanilamide Tablets usually available contain the following amounts of sulfanilamide: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DOSE OF SULFANILAMIDE—2 Gm. (approximately 30 grains).

Sulfarsphenamine

SULFARSPHENAMINE

Sulfarsphenamina

Sulfarsphen.

Sulfarsphenamine consists chiefly of disodium 3,3′-diamino-4,4′-dihydroxyarsenobenzene-*N*-dimethylenesulfonate. It contains not less than 19 per cent of arsenic (As).

Sulfarsphenamine must be prepared in an establishment licensed for the purpose by the United States Government upon recommendation of the Surgeon General of the United States Public Health Service. Each lot of the product before being offered for sale must comply with the toxicity, labeling, and other requirements of the National Institute of Health, and be released by the Institute.

Description—Sulfarsphenamine occurs as a yellow powder. It is odorless or has a very slight odor resembling that of sulfur dioxide. In the dry state or in solution, it is slowly oxidized by exposure to air, becoming dark and more toxic. Its solutions are faintly acid to litmus paper.

Solubility—Sulfarsphenamine is very soluble in water; it is slightly soluble in alcohol, and insoluble in ether.

Identification—

A: The solution resulting from the *Assay* yields with hydrogen sulfide a yellow precipitate, which is soluble in ammonium carbonate T.S.

B: Mix 0.5 cc. of diluted hydrochloric acid with 20 cc. of a solution of Sulfarsphenamine (1 in 100): no precipitate is formed (Neoarsphenamine yields a heavy precipitate within 1 minute).

C: Add sodium hydroxide T.S., drop by drop, to 10 cc. of a solution of Sulfarsphenamine (1 in 100): no precipitate is produced (Arsphenamine yields a precipitate which dissolves readily in an excess of the reagent).

D: Add 2 drops of freshly prepared ferric chloride T.S. to 5 cc. of a solution of Sulfarsphenamine (1 in 1000): a dark red color is produced.

E: To 10 cc. of a solution of Sulfarsphenamine (1 in 100) add 10 cc. of diluted hydrochloric acid, and heat: the odor of sulfur dioxide is perceptible.

Completeness of solution—Add 600 mg. of Sulfarsphenamine to 3 cc. of water in a test tube or small cylinder and gently rotate the mixture: complete solution results within 5 minutes.

Loss on drying—When dried in a vacuum desiccator over fresh phosphorus pentoxide for 24 hours, Sulfarsphenamine loses not more than 1.5 per cent of its weight.

Assay—Place about 200 mg. of Sulfarsphenamine, accurately weighed, in a glass-stoppered, 200- to 300-cc. flask. Add 1 Gm. of finely powdered potassium permanganate and 5 cc. of diluted sulfuric acid, and allow to stand for 10 minutes, rotating the contents of the flask during this time to insure thorough mixing. Cautiously add 10 cc. of sulfuric acid in portions of about 2 cc., rotating the flask after each addition. When the reaction has ceased, add sufficient hydrogen peroxide T.S. to dissolve completely the brown precipitate (about 5 to 7 cc.). Toward the end of the reaction add the hydrogen peroxide T.S., dropwise, to avoid any great excess. Dilute with 25 cc. of water, and boil gently over an asbestos-wire gauze for 15 to 20 minutes, or until the excess of hydrogen peroxide is expelled. Dilute with 50 cc. of water, and add tenth-normal potassium permanganate until the liquid is faintly pink, then discharge the pink color by the addition of a drop of tenth-normal oxalic acid. Cool the solution, add 2.5 Gm. of potassium iodide, stopper the flask tightly, and allow it to stand in a cool, dark place for 1 hour. Then titrate the liberated iodine with tenth-normal sodium thiosulfate without the use of starch indicator. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal sodium thiosulfate is equivalent to 3.746 mg. of As.

Packaging and storage—Preserve Sulfarsphenamine at a temperature preferably not above 25°, in sealed tubes of colorless glass, from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas.

Labeling—The ampul label must bear the official title, the amount in grams or in milligrams of the Sulfarsphenamine contained in the ampul, the lot number of the product, and the name of the manufacturer.

The label on the outside of the container of one or more ampuls must bear the official title, the amount in grams or in milligrams of the Sulfarsphenamine contained in each ampul, the lot number of the product, the name and address of the manufacturer, the U. S. license number of the manufacturer, and the expiration date for the product.

The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its quality) shall not be more than 5 years from the date of release of that lot by the National Institute of Health.

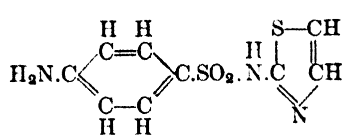
AVERAGE DOSE—Intramuscular, **0.45 Gm.** (approximately 7 grains).

Sulfathiazole

SULFATHIAZOLE

Sulfathiazolum

Sulfathiazol.



$C_9H_9N_3O_2S_2$ Mol. wt. 255.31

Sulfathiazole, when dried at 100° for 4 hours, contains not less than 99 per cent of $C_9H_9N_3O_2S_2$.

Description—Sulfathiazole occurs as white or faintly yellowish white crystals, granules, or powder. It is odorless or nearly so, and is stable in air, but slowly darkens on exposure to light.

Solubility—One Gm. of Sulfathiazole dissolves in about 1700 cc. of water, and in about 200 cc. of alcohol. It is soluble in acetone, and freely soluble in diluted mineral acids, in solutions of potassium and sodium hydroxides, and in ammonia T.S.

Melting range—Sulfathiazole melts between 200° and 204°, page 667.

Identification—

A: Add 5 cc. of diluted hydrochloric acid to 100 mg. of Sulfathiazole, and boil gently for about 5 minutes. Cool in an ice bath, then add 4 cc. of a solution of sodium nitrite (1 in 100), dilute with water to 10 cc., and place the mixture in an ice bath for 10 minutes. To 5 cc. of the cooled mixture, add a solution of 50 mg. of betanaphthol in 2 cc. of solution of sodium hydroxide (1 in 10): an orange-red precipitate is produced which darkens on standing.

B: Carefully heat about 50 mg. of Sulfathiazole in a small test tube over an open flame until it melts. A brown to red color develops, and on further heating the odors of ammonia, aniline, and hydrogen sulfide are evolved. (Sulfanilamide produces a blue-violet color and the odor of ammonia, and sulfapyridine evolves the odor of sulfur dioxide.)

C: To about 20 mg. of Sulfathiazole suspended in 5 cc. of water add, dropwise, sodium hydroxide T.S. until dissolved, then add 2 or 3 drops of cupric sulfate T.S.: a purple precipitate forms. (Sulfapyridine gives a green precipitate, and sulfanilamide gives a blue color or precipitate.)

Clarity and color of solution—A solution of 500 mg. of Sulfathiazole in a mixture of 20 cc. of water and 3 cc. of sodium hydroxide T.S. is clear and colorless.

Acid—Digest 2 Gm. of Sulfathiazole with 100 cc. of water at about 70° for 5 minutes, cool at once to about 20°, and filter. To 25 cc. of the filtrate add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide: not more than 0.5 cc. of the sodium hydroxide is required to produce a pink color.

Loss on drying—Dry about 1 Gm. of Sulfathiazole, accurately weighed, at 100° for 4 hours: it loses not more than 0.5 per cent of its weight.

Residue on ignition—Sulfathiazole yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—A 25-cc. portion of the filtrate prepared in the test for *Acid* shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—Another 25-cc. portion of the filtrate prepared in the test for *Acid* shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.

Heavy metals—Dissolve 500 mg. of Sulfathiazole in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of water, and add to the solution 5 drops of sodium sulfide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfathiazole, previously dried at 100° for 4 hours, and transfer it to a beaker or casserole. Add 5 cc. of hydrochloric acid and 50 cc. of water, cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch-iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 25.53 mg. of $C_9H_9N_3O_2S_2$.

Packaging and storage—Preserve Sulfathiazole in well-closed, light-resistant containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

SULFATHIAZOLE TABLETS

Tabellæ Sulfathiazoli

Tab. Sulfathiazol.

Sulfathiazole Tablets contain not less than 95 per cent and not more than 105 per cent of the labeled amount of $C_9H_9N_3O_2S_2$.

Identification—Triturate a quantity of finely powdered Sulfathiazole Tablets, equivalent to about 500 mg. of sulfathiazole, with two 5-cc. portions of chloroform, and discard the chloroform. Triturate the residue with 10 cc. of ammonia T.S. for 5 minutes, add 10 cc. of water, and filter. Warm the filtrate until most of the ammonia is expelled, cool, and add acetic acid to a distinctly acid reaction: a precipitate of sulfathiazole is formed. Collect the precipitate on a filter, wash it well with cold water, and dry at 100°. The sulfathiazole so obtained melts between 200° and 204°, page 667, and responds to *Identification tests A, B,* and *C* under *Sulfathiazole*, page 537.

Assay—Weigh a counted number of not less than 20 Sulfathiazole Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to about 500 mg. of sulfathiazole, and transfer it to a beaker or a casserole. Add 5 cc. of hydrochloric acid and 50 cc. of water. Cool to 15°, add about 25 Gm. of crushed ice, and slowly titrate with tenth-molar sodium nitrite until a blue color is produced immediately when a glass rod dipped in the solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point is reproducible after the mixture has been allowed to stand for 1 minute. Each cc. of tenth-molar sodium nitrite is equivalent to 25.53 mg. of $C_9H_9N_3O_2S_2$.

Packaging and storage—Preserve Sulfathiazole Tablets in well-closed containers.

Sizes—Sulfathiazole Tablets usually available contain the following amounts of sulfathiazole: 300 and 500 mg. (5 and 7½ grains).

AVERAGE DOSE OF SULFATHIAZOLE—2 Gm. (approximately 30 grains).

SULFATHIAZOLE SODIUM

Sulfathiazolum Sodicum

Sulfathiazol. Sod.—Soluble Sulfathiazole

$C_9H_8N_3O_2S_2Na.1\frac{1}{2}H_2O$ Mol. wt. 304.32

Sulfathiazole Sodium, when dried at 100° for 5 hours, contains not less than 99 per cent of $C_9H_8N_3O_2S_2Na$.

Description—Sulfathiazole Sodium occurs as a white to faintly yellowish white powder or granules. On prolonged exposure to humid air, it absorbs carbon dioxide with the liberation of sulfathiazole and becomes incompletely soluble in water. It is affected by light. Its solutions are alkaline to phenolphthalein T.S.

Solubility—One Gm. of Sulfathiazole Sodium dissolves in about 2.5 cc. of water and in about 15 cc. of alcohol.

Identification—
A: Dissolve about 1 Gm. of Sulfathiazole Sodium in 25 cc. of water, and add 2 cc. of acetic acid: a white precipitate of sulfathiazole is formed. Collect the precipitate on a filter, wash it well with cold water, and dry at 100° for 4 hours: the sulfathiazole so obtained melts between 200° and 204°, page 667, and responds to *Identification tests A, B,* and *C* under *Sulfathiazole*, page 537.
B: Ignite about 500 mg. of Sulfathiazole Sodium: the residue responds to the test for *Sodium*, page 663.

Loss on drying—Dry about 1 Gm. of Sulfathiazole Sodium, accurately weighed, at 100° for 5 hours: the loss in weight corresponds to not less than 6 per cent and not more than 9 per cent of its weight.

Heavy metals—Dissolve 500 mg. of Sulfathiazole Sodium in 25 cc. of water and add 5 drops of sodium sulfide T.S. If a dark color is produced, it is not darker than that produced in a control to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Assay—Weigh accurately about 500 mg. of Sulfathiazole Sodium, previously dried at 100° for 5 hours, and proceed with the assay as directed under *Sulfathiazole*, page 537, beginning with the words "Add 5 cc. of hydrochloric acid, etc." Each cc. of tenth-molar sodium nitrite is equivalent to 27.73 mg. of $C_9H_8N_3O_2S_2Na$.

Packaging and storage—Preserve Sulfathiazole Sodium in tight, light-resistant containers.

AVERAGE DOSE—**2 Gm.** (approximately 30 grains).

Sulfathiazole Sodium, Sterile

STERILE SULFATHIAZOLE SODIUM

Sulfathiazolum Sodicum Sterile

Sulfathiazol. Sod. Steril.—Sterile Sodium Sulfathiazole

$C_9H_8N_3O_2S_2Na$ Mol. wt. 277.30

Sterile Sulfathiazole Sodium is, substantially, anhydrous sulfathiazole sodium. When dried at 100° for 5 hours, it contains not less than 99 per cent of $C_9H_8N_3O_2S_2Na$, and meets the requirements of the *Sterility Tests for Solids*, page 689.

Sterile Sulfathiazole Sodium conforms to the *Description* and meets the *Identification tests* and other requirements under *Sulfathiazole Sodium*, page 539, except that when dried at 100° for 5 hours, the loss in weight corresponds to not more than 0.2 per cent.

Completeness of solution—Place 5 Gm. of Sterile Sulfathiazole Sodium in a glass-stoppered, 25-cc. cylinder, nearly fill the cylinder with carbon dioxide-free water, and shake gently until dissolved: the solution is clear.

Assay—Proceed as directed under the *Assay* for *Sulfathiazole Sodium*, page 539. Each cc. of tenth-molar sodium nitrite is equivalent to 27.73 mg. of $C_9H_8N_3O_2S_2Na$.

Packaging and storage—Preserve Sterile Sulfathiazole Sodium in tight containers so closed that the sterility of the product is maintained until the package is opened for use. Each package contains not more than 10 Gm. of Sterile Sulfathiazole Sodium. The container may be of such size as to permit solution within the container.

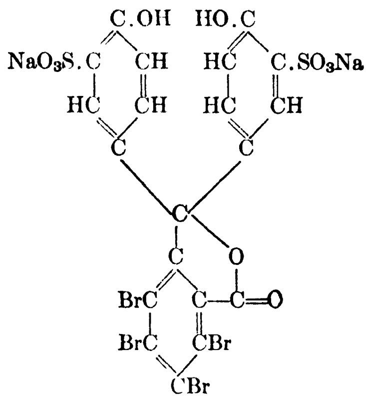
Labeling—The quantity of Sterile Sulfathiazole Sodium and the lot number must be stated on the label of each package.

AVERAGE DOSE—Intravenous, 2 Gm. (approximately 30 grains).

SULFOBROMOPHTHALEIN SODIUM

Sulfobromophthaleinum Sodicum

Sulfobromophthal. Sod.



$C_{20}H_8Br_4O_{10}S_2Na_2$ Mol. wt. 838.04

Description—Sulfobromophthalein Sodium occurs as a white, crystalline powder. It is odorless and has a bitter taste. It is hygroscopic.

Solubility—Sulfobromophthalein Sodium is soluble in water, but is insoluble in alcohol and in acetone.

Identification—

A: Dissolve 50 mg. of Sulfobromophthalein Sodium in 50 cc. of water, add 1 cc. of this solution to 50 cc. of freshly boiled and cooled water, then add a few drops of sodium hydroxide T.S.: an intense bluish purple color develops.

B: Mix about 100 mg. of Sulfobromophthalein Sodium with 500 mg. of sodium carbonate, and ignite until thoroughly charred. Cool, add 5 cc. of hot water, heat for 5 minutes on a steam bath, and filter: the solution responds to the tests for *Bromide*, page 659.

C: Sulfobromophthalein Sodium responds to the flame test for *Sodium*, page 663.

Loss on drying—Dry about 500 mg. of Sulfobromophthalein Sodium, accurately weighed, at 100° for 3 hours: the loss in weight does not exceed 5 per cent.

Sensitiveness—Dissolve 10 mg. of Sulfobromophthalein Sodium in 10 cc. of water. Add 0.2 cc. of this solution to 50 cc. of freshly boiled and cooled water, then add 0.2 cc. of fiftieth-normal sodium hydroxide: a strong violet color is produced, which is discharged by the addition of 0.2 cc. of fiftieth-normal sulfuric acid.

Color and completeness of solution—A solution of 200 mg. of Sulfobromophthalein Sodium in 10 cc. of water is complete and colorless.

Halide ion—To 5 cc. of a solution of Sulfobromophthalein Sodium (1 in 100), add 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S.: not more than a slight opalescence is produced.

Sulfate—To 2 cc. of a solution of Sulfobromophthalein Sodium (1 in 100), add 1 drop of diluted hydrochloric acid, heat to boiling, and add 1 cc. of barium chloride T.S.: the solution remains clear while hot. (On cooling, crystals of a difficultly soluble barium salt of sulfobromophthalein form, which appear under the microscope as groups of platelets.)

Packaging and storage—Preserve Sulfobromophthalein Sodium in tight containers.

Sulfobromophthalein Sodium Injection

SULFOBROMOPHTHALEIN SODIUM INJECTION

Injectio Sulfobromophthaleini Sodici

Inj. Sulfobromophthal. Sod.

Sulfobromophthalein Sodium Injection is a colorless, or almost colorless, sterile solution of sulfobromophthalein sodium in water for injection. It contains not less than 94 per cent and not more than 106 per cent of the labeled amount of $C_{20}H_8Br_4O_{10}S_2Na_2$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Sulfobromophthalein Sodium Injection preferably by Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—

A: The Injection responds to *Identification test A* under *Sulfobromophthalein Sodium*, page 541, and to the flame test for *Sodium*, page 663.

B: To a volume of the Injection containing about 50 mg. of sulfobromophthalein sodium add 500 mg. of sodium carbonate, evaporate to dryness, and ignite. The residue responds to *Identification test B* under *Sulfobromophthalein Sodium*, page 541.

Sensitiveness—Dilute the Injection with water to a concentration of 1 mg. of sulfobromophthalein sodium in each cc. Add 0.2 cc. of this dilution to 50 cc. of recently boiled and cooled water, then add 0.2 cc. of fiftieth-normal sodium hydroxide. The liquid acquires a strong violet color, and the color is discharged on the subsequent addition of 0.2 cc. of fiftieth-normal sulfuric acid.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, equivalent to about 150 mg. of sulfobromophthalein sodium, to a tared dish, evaporate to dryness on a steam bath, and dry at 100° to constant weight: the weight of the residue represents the quantity of sulfobromophthalein sodium in the volume of the Injection taken for the assay.

Packaging and storage—Preserve Sulfobromophthalein Sodium Injection preferably in single-dose, hermetic containers or in other suitable containers. See *Containers for Injections*, page 630.

Sizes—Sulfobromophthalein Sodium Injection usually available contains the following amount of sulfobromophthalein sodium: 150 mg. ($2\frac{1}{2}$ grains) in 3 cc.

AVERAGE DOSE OF SULFOBROMOPHTHALEIN SODIUM—For each kilogram of body weight, intravenous, 2 mg. (approximately $\frac{1}{30}$ grain).

SULFUR OINTMENT

Unguentum Sulfuris

Ung. Sulfur.

Sulfur Ointment contains not less than 13.5 per cent and not more than 16.5 per cent of S.

Precipitated Sulfur	150 Gm.
Wool Fat	70 Gm.
White Ointment	780 Gm.
To make	1000 Gm.

Levigate the sulfur with the wool fat and 100 Gm. of white ointment, and incorporate the mixture with the remainder of the white ointment (see page 2).

Assay—Place about 500 mg. of Sulfur Ointment in a tared Erlenmeyer flask of suitable capacity, and weigh accurately. Add 5 cc. of nitric acid and 3 cc. of bromine, and heat the mixture gently until the excess of bromine has been dissipated. Add 50 cc. of water, and transfer the mixture to a separator. Extract the liquid with three successive portions of 30, 20, and 10 cc. of ether, respectively, to remove the ether-soluble ingredients. Wash the combined ether extracts with about 10 cc. of water, and add this washing to the water solution. Dilute the water solution to about 200 cc. with water, and acidify with hydrochloric acid. Heat the solution to boiling, and add hot barium chloride T.S. in small portions until no further precipitation takes place. Heat on a water bath for 1 hour, then collect the precipitate on a filter, wash it well with hot water, dry, and ignite to constant weight. The weight of the barium sulfate thus obtained, multiplied by 0.1373, indicates its equivalent of S.

PRECIPITATED SULFUR

Sulfur Præcipitatum

Sulfur Præc.

S At. wt. 32.06

Precipitated Sulfur, when dried for 18 hours over sulfuric acid, contains not less than 99.5 per cent of S.

Description—Precipitated Sulfur is a very fine, pale yellow, amorphous or microcrystalline powder, without odor or taste.

Solubility and identification—Precipitated Sulfur has the *Solubility* of and responds to the *Identification test* under *Sublimed Sulfur*, page 544.

Loss on drying—When dried for 18 hours over sulfuric acid, Precipitated Sulfur loses not more than 1 per cent of its weight.

Residue on ignition—Precipitated Sulfur leaves not more than 0.3 per cent of residue on ignition, page 685.

Acid or alkali—Agitate 2 Gm. of Precipitated Sulfur with 10 cc. of water, and filter: the filtrate is neutral to litmus paper.

Arsenic—Precipitated Sulfur meets the requirements of the test for *Arsenic* under *Sublimed Sulfur*, page 544.

Other forms of sulfur—Shake 1 Gm. of Precipitated Sulfur with 5 cc. of carbon disulfide: it dissolves quickly, with the exception of a small amount of insoluble matter, which is usually present.

Assay—Dry about 1 Gm. of Precipitated Sulfur over sulfuric acid for 18 hours, weigh accurately, and transfer it to a flask containing 50 cc. of a solution of potassium hydroxide in diluted alcohol (1 in 10). Boil the mixture until the liquid is transparent and the Sulfur is dissolved, then dilute it with water to measure exactly 250 cc. Transfer exactly 25 cc. of the solution to a 400-cc. beaker, add 50 cc. of hydrogen peroxide T.S., or more, if necessary, to oxidize the sulfur completely, and heat on a water bath for 1 hour. Acidify the liquid with hydrochloric acid, dilute it with 200 cc. of water, heat to boiling, and add hot barium chloride T.S. in small portions until no further precipitation takes place. Heat on a water bath for 1 hour, then collect the precipitate on a filter, wash, dry, and ignite to constant weight. Perform a blank test, using the same quantities of the same reagents and in the same manner, and make any necessary correction. The weight of the barium sulfate, multiplied by 0.1373, represents its equivalent of S.

Packaging and storage—Preserve Precipitated Sulfur in well-closed containers.

AVERAGE DOSE—4 Gm. (approximately 60 grains).

Sulfur, Sublimed

SUBLIMED SULFUR

Sulfur Sublimatum

Sulfur Sublim.—Flowers of Sulfur

S At. wt. 32.06

Sublimed Sulfur, when dried over sulfuric acid for 18 hours, contains not less than 99.5 per cent of S.

Description—Sublimed Sulfur is a fine, yellow, crystalline powder having a faint odor and taste.

Solubility—Sublimed Sulfur is practically insoluble in water, and nearly insoluble in alcohol. One Gm. dissolves slowly and usually incompletely in about 2 cc. of carbon disulfide. One Gm. dissolves in about 100 cc. of olive oil.

Identification—Sublimed Sulfur burns in the air to sulfur dioxide, which can be recognized by its characteristic odor.

Residue on ignition—Sublimed Sulfur leaves not more than 0.5 per cent of residue on ignition, page 685.

Arsenic—Digest 1 Gm. of Sublimed Sulfur for 3 hours with 10 cc. of ammonia T.S., and filter. Evaporate the clear filtrate to dryness on a water bath, add 1 cc. of nitric acid, and again evaporate to dryness: the residue meets the requirements of the test for *Arsenic*, page 618 (2 parts per million).

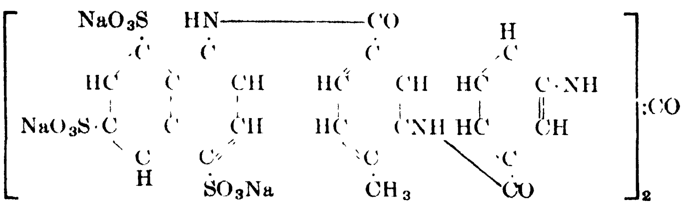
Assay—Dry Sublimed Sulfur over sulfuric acid for 18 hours, and proceed as directed under *Precipitated Sulfur*, page 543.

Packaging and storage—Preserve Sublimed Sulfur in well-closed containers.

SURAMIN SODIUM

Suraminum Sodicum

Suramin. Sod. –Naphuride Bayer 205, Suramin



$C_{51}H_{34}N_6O_{23}S_6Na_6$ Mol. wt. 1429.17

Description—Suramin Sodium occurs as a white or slightly pink powder. It is odorless and has a slightly bitter taste. It is very hygroscopic and is affected by light.

Solubility—Suramin Sodium is soluble in water and slightly soluble in alcohol. It is insoluble in ether, in chloroform, and in benzene.

Identification—

A: Add 50 mg. of Suramin Sodium to 2 cc. of diluted sulfuric acid (1 in 2) and boil for 5 minutes. Cool, add 20 cc. of sodium nitrite solution (1 in 100) and allow to stand for 2 minutes. Add 0.2 cc. of this solution to 5 cc. of acetic acid which contains 10 mg. of α-naphthylamine hydrochloride and 500 mg. of sodium acetate: a purplish red color develops rapidly.

B: Suramin Sodium responds to the flame test for *Sodium*, page 663.

Loss on drying—When dried to constant weight at 150°, Suramin Sodium loses not more than 12 per cent of its weight.

Completeness and reaction of solution—Dissolve 1.0 Gm. of Suramin Sodium in 100 cc. of carbon dioxide-free water: the solution is clear, and has a pH of not less than 5.5 and not more than 7.0.

Chloride—Transfer about 1 Gm. of Suramin Sodium, accurately weighed, to a flask with the aid of 30 cc. of water. Add 3 cc. of nitric acid, previously diluted with 10 cc. of water, then add, while stirring, exactly 10 cc. of tenth-normal silver nitrate and 3 cc. of nitrobenzene. Shake vigorously, then titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 3.546 mg. of Cl. The chloride (Cl) content does not exceed 1.2 per cent.

Sulfate—Dissolve 500 mg. of Suramin Sodium in 20 cc. of water and divide it into two equal portions. To one portion (A) add 1 cc. of barium chloride T.S., and to the other portion (B) add 1 cc. of water: after 5 minutes A is as clear as B.

Free amine—Place 5 Gm. of Suramin Sodium in a beaker, or casserole, and dissolve it in 300 cc. of water and 5 cc. of hydrochloric acid. Cool the solution to 15° and titrate with tenth-molar sodium nitrite, stirring vigorously, until a blue color is produced immediately when a glass rod dipped into the titrated solution is streaked on a smear of starch iodide paste T.S. Perform a blank determination with the same reagents and in the same manner: the difference between the two titrations does not exceed 0.5 cc. of tenth-molar sodium nitrite.

Heavy metals—Dissolve 500 mg. of Suramin Sodium in a mixture of 5 cc. of sodium hydroxide T.S. and 20 cc. of water, and add to the solution 5 drops of sodium sul-

fide T.S. If a darkening of the solution is produced, it is not more than that produced in a control made with the same reagents and to which 1 cc. of the standard lead solution, page 657, has been added, corresponding to a heavy metals limit of 20 parts per million.

Undue toxicity—Prepare a solution of Suramin Sodium in water for injection (1 in 40). Inject this solution intravenously into each of ten mice, using an amount equivalent to 0.012 cc. per Gm. of body weight: not more than five of the mice die in 3 days. If more than five die in 3 days, inject each of twenty mice in a similar manner: the total number of mice in the two series that die within 3 days from the time of injection shall not exceed fifteen.

Packaging and storage—Preserve Suramin Sodium in tight, light-resistant containers and avoid exposure to excessive heat.

AVERAGE DOSE—Intravenous, 1 Gm. (approximately 15 grains).

Sutures, Surgical

SURGICAL SUTURES

Chordæ Chirurgicales

Surgical Sutures are strands of material other than silk or the intestinal fibers of sheep. They may be composed each of a single filament, or of filaments or fibers twisted or braided together, and may be coated or uncoated. Surgical Sutures may be sterilized by steam under 15 pounds pressure (121.5°), for 30 minutes.

Description—Surgical Sutures may be composed of metal or of organic materials. They may be naturally colored or dyed. Dyed Surgical Sutures shall be "iron dyed," or dyed with a harmless vegetable color, or with a certified coal-tar color. All uncombined dye shall be removed from the material, so that the color of the suture will not bleed into the tissue.

Note—If the Surgical Suture is composed of organic material, expose it, unless otherwise directed, for at least 4 hours to an atmosphere having a relative humidity of 65 per cent ±2 per cent at 21° ±1.1° (70° F. ±2°) prior to making the required measurements.

Length—Determine the length of Surgical Sutures while the strand is laid out smooth, without tension, on a plane surface: the actual length of each strand is not less than 90 per cent of the length stated on the label.

Diameter—Determine the diameter of Surgical Sutures as directed under *Diameter of Sutures*, page 639, the strand being held under a tension equal to one-fourth of the required minimum tensile strength of the size being tested, without being permitted to untwist if a twisted strand. If the Suture is braided, two measurements shall be made at each point, the measurements being at right angles to each other. The recorded diameter of a braided Suture shall be the average of the diameters determined at right angles at each point.

To determine the diameter of Surgical Sutures 5 strands shall be tested. A strand is a continuous length of Suture in a package. The diameter shall be determined at three quarterly points in a 24-inch length, namely, at 6, 12, and 18 inches.

If the length of the strand does not exceed 5 feet, one section shall be measured, the section being at the approximate center of the strand.

If the length of the strand is greater than 5 feet, but does not exceed 10 feet, two sets of measurements shall be made, one set at the approximate center of each half of the strand.

If the length of the strand is greater than 10 feet, but does not exceed 90 feet, three sets of measurements shall be made, one set at the approximate center of each third of the strand.

If the length of the strand is greater than 90 feet, four sets of measurements shall be made, one set at the approximate center of each fourth of the strand.

The average diameter of the strand being measured shall be within the tolerances prescribed for the size claimed on the label. The average of the determined minimum diameters of the strand shall not be less than the mean specified diameter of the next smaller size. The average of the determined maximum diameters shall not be greater than the mean specified diameter for the next larger size.

Diameter of Surgical Suture					Tensile Strength of Surgical Suture
Size	Millimeter		Inch		Minimum Tensile Strength[1] of Surgical Suture in Avoirdupois Pounds on Straight Pull
	Min.	Max.	Min.	Max.	
0000000, 7-0	0.025	0.051	0.001	0.002	0.25
000000, 6-0	0.051	0.102	0.002	0.004	0.5
00000, 5-0	0.102	0.152	0.004	0.006	1
0000, 4-0	0.152	0.203	0.006	0.008	2
000, 3-0	0.203	0.254	0.008	0.010	3
00, 2-0	0.254	0.330	0.010	0.013	5
0, 1-0	0.330	0.406	0.013	0.016	7
1	0.406	0 483	0.016	0.019	10
2	0.483	0.559	0.019	0.022	13
3	0.559	0.635	0.022	0.025	16
4	0.635	0.711	0.025	0.028	20
5	0.711	0.813	0.028	0.032	25
6	0.813	0.914	0.032	0.036	30
7	0.914	1.016	0.036	0.040	35

Tensile strength—Determine the tensile strength of Surgical Sutures by the straight pull test as directed under *Tensile Strength Determination*, page 699, using the Incline Plane Tester. The tensile strength of any size, determined on the average strength of at least 5 strands from any one lot, and making at least 2 breaks on each strand, meets the requirements of the above table. If the labeled length of the strand is not less than 25 yards, take 2 yards from each of 5 strands selected at random from the lot, rejecting the first 12 inches, and make at least 2 breaks on each strand.

Sterile Surgical Sutures that have been packaged in a tubing fluid have a tensile strength, determined immediately after removal from the tubing fluid and without drying, of not less than 80 per cent of that required in the table.

Sterility—When Surgical Sutures are claimed to be sterile, they meet the requirements of the *Sterility Test for Solids*, page 689.

Packaging and storage—Preserve Surgical Sutures in well-closed containers.

Preserve sterile Surgical Sutures in hermetically sealed containers or in other containers holding not more than 3 strands, and which will maintain the sterility

[1] The Minimum Tensile Strength of cotton Surgical Sutures may be not more than 40 per cent below the required values in this table.

of the Sutures until the container is opened for use. The Sutures may be packaged in a suitable tubing fluid. Unless hermetically sealed, the containers of sterile Surgical Sutures must be grouped in a second protective container. Sterile Surgical Sutures must be sterilized in the container, and protected from contamination.

Labeling—The material from which Surgical Sutures are made, their construction, size, and length shall be stated on the package.

Each container of one or more strands of sterile Surgical Sutures, and each package of one or more containers, shall indicate the material, the size, the length, and the name of the manufacturer. The package shall also indicate the address of the manufacturer, the lot number identifying the method and time of sterilization, and, if a tubing fluid is used, its composition shall be stated on the package.

SYRUP

Syrupus

Sirup, Simple Syrup

Sucrose	850 Gm.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Insert into the neck of a percolator of suitable size a pledget of purified cotton, not too tightly, but in such a manner that the cotton nearly fills the neck of the percolator, and moisten it with a few drops of distilled water. Place the sucrose in the percolator, make its surface level without shaking or jarring, then carefully pour upon it 450 cc. of distilled water, and regulate the flow of the liquid, if necessary, so that it will drop rapidly. Collect the percolate in a 1000-cc. graduated container and, if necessary, repass portions of it through the percolator to dissolve all of the sucrose. Then pass enough distilled water through the cotton to make the product measure 1000 cc. Mix thoroughly.

Syrup may also be prepared in the following manner:

Heat 450 cc. of distilled water to boiling, add the sucrose, and continue to heat it cautiously, stirring continuously, until the sucrose is dissolved and the syrup has a temperature of 100°. Then filter it through purified cotton or other suitable filter, and rinse the container with small portions of hot distilled water, passing the rinsings through the filter until the product measures 1000 cc. when cold. Mix thoroughly.

Specific gravity—The specific gravity of Syrup is about 1.313.

Packaging and storage—Preserve Syrup in tight containers, preferably at a temperature not above 25°.

Syrups

Tablets

TALC

Talcum

Talc.—Purified Talc U. S. P. XII

Talc is a native, hydrous magnesium silicate, sometimes containing a small proportion of aluminum silicate.

Description—Talc is a very fine white or grayish white, crystalline powder. It is unctuous, adhering readily to the skin, and is free from grittiness.

Identification—Mix 500 mg. of Talc with about 200 mg. of anhydrous sodium carbonate and 2 Gm. of anhydrous potassium carbonate, and heat the mixture in a platinum crucible until fusion is complete. Cool, and transfer the fused mixture to a dish or beaker with the aid of about 50 cc. of hot water. Add hydrochloric acid to the liquid until it ceases to cause effervescence, then add 10 cc. more of the acid, and evaporate the mixture to dryness on a water bath. Cool, add 20 cc. of water, boil, and filter the mixture: an insoluble residue of silica remains. Dissolve in the filtrate about 2 Gm. of ammonium chloride, and add 5 cc. of ammonia T.S. Remove by filtration any precipitate which may form, and add sodium phosphate T.S. to the filtrate: a white, crystalline precipitate of magnesium ammonium phosphate separates.

Loss on ignition—When ignited at a red heat, Talc loses not more than 5 per cent of its weight.

Acid-soluble substances—Digest 1 Gm. of Talc with 20 cc. of diluted hydrochloric acid at 50° for 15 minutes and filter. To 10 cc. of the filtrate add 1 cc. of diluted sulfuric acid, evaporate, and ignite to constant weight: the weight of the residue is not more than 10 mg.

Reaction and soluble substances—Boil 10 Gm. of Talc with 50 cc. of water for 30 minutes, adding water from time to time to maintain approximately the original volume, and filter. The filtrate is neutral to litmus paper. One-half of this filtrate, when evaporated and dried to constant weight at 110°, yields not more than 5 mg. of residue.

Water-soluble iron—The remaining half of the filtrate obtained in the test for *Reaction and soluble substances*, after being slightly acidulated with hydrochloric acid, does not acquire a blue color upon the addition of potassium ferrocyanide T.S.

Packaging and storage—Preserve Talc in well-closed containers.

Tannic Acid

TANNIC ACID

Acidum Tannicum

Acid. Tan.—Gallotannic Acid, Tannin

Tannic Acid is a tannin usually obtained from nutgalls, the excrescences obtained from the young twigs of *Quercus infectoria* Olivier, and other allied species of *Quercus* (Fam. *Fagaceæ*).

Description—Tannic Acid occurs as an amorphous powder, as glistening scales, or as spongy masses, varying in color from yellowish white to light brown. It is odorless or has a faint, characteristic odor, and a strongly astringent taste.

Solubility—Tannic Acid is very soluble in water, in acetone, and in alcohol. It is freely soluble in diluted alcohol but only slightly soluble in dehydrated alcohol. It is almost insoluble in benzene, in chloroform, in ether, and in petroleum benzin. One Gm. of Tannic Acid dissolves in about 1 cc. of warm glycerin.

Identification—

A: The addition of a small quantity of ferric chloride T.S. to a solution of Tannic Acid produces a bluish black color or precipitate.

B: A solution of Tannic Acid produces precipitates in solutions of most of the alkaloidal salts, and also in solutions of albumin, of gelatin, and of starch.

Loss on drying—Tannic Acid loses not more than 12 per cent of its weight when dried for 2 hours at 100°.

Residue on ignition—Tannic Acid yields not more than 1 per cent of residue on ignition, page 685.

Gum or dextrin—Dissolve 2 Gm. of Tannic Acid in 10 cc. of hot water: the solution is not more than slightly turbid. Cool and filter the solution, and divide it into two equal portions. One portion is not rendered turbid by the addition of 10 cc. of alcohol.
Resinous substances—The other portion of the solution obtained in the test for *Gum or dextrin* is not rendered turbid by the addition of 10 cc. of water.
Packaging and storage—Preserve Tannic Acid in tight, light-resistant containers.

Tannic Acid Glycerite

TANNIC ACID GLYCERITE

Glyceritum Acidi Tannici

Glycer. Acid. Tan.—Glycerite of Tannin

Tannic Acid	20 Gm.
Sodium Citrate	1 Gm.
Exsiccated Sodium Sulfite	0.2 Gm.
Glycerin	78.8 Gm.
To make	100 Gm.

Rub the tannic acid, exsiccated sodium sulfite, and sodium citrate in a porcelain dish with about half of the glycerin until a smooth mixture is produced, then add the remainder of the glycerin, and mix well. Heat the mixture on a sand bath to a temperature between 115° and 120°, with occasional stirring, until solution is complete.

Packaging and storage—Preserve Tannic Acid Glycerite in tight containers.

Tannic Acid Ointment

TANNIC ACID OINTMENT

Unguentum Acidi Tannici

Ung. Acid. Tan.

Caution—During its manufacture and storage this Ointment must not come in contact with iron utensils or containers.

Tannic Acid	200 Gm.
Glycerin	250 Gm.
Exsiccated Sodium Sulfite	2 Gm.
Yellow Ointment	548 Gm.
To make	1000 Gm.

Heat the glycerin on a water bath. Dissolve the tannic acid and the exsiccated sodium sulfite in the warm glycerin and incorporate the solution into the yellow ointment (see page 2).

Tar, Coal

COAL TAR

Pix Carbonis

Pix Carbon.

Coal Tar is the tar obtained as a by-product during the destructive distillation of bituminous coal.

Description—Coal Tar is a nearly black, thick liquid, heavier than water, with a characteristic naphthalene-like odor and a sharp burning taste.
Solubility—Coal Tar is only slightly soluble in water, to which it imparts its characteristic odor and taste and a faintly alkaline reaction. It is but partially dissolved by alcohol, acetone, methanol, petroleum benzin, carbon disulfide, chloroform, or ether; to the extent of about 95 per cent by benzene, and entirely by nitrobenzene with the exception of a small amount of suspended matter.
Residue on ignition—Coal Tar burns with a reddish, luminous and very sooty flame, and upon prolonged ignition is almost entirely consumed, leaving not more than 2 per cent of residue.
Packaging and storage—Preserve Coal Tar in tight containers.

Tar, Coal, Ointment

COAL TAR OINTMENT

Unguentum Picis Carbonis

Ung. Pic. Carbon.

Coal Tar	50 Gm.
Starch	250 Gm.
Zinc Oxide	250 Gm.
White Petrolatum	450 Gm.
To make	1000 Gm.

Incorporate the starch and the zinc oxide with the white petrolatum to a smooth paste, then add the coal tar and mix thoroughly.

Tar, Juniper

JUNIPER TAR

Pix Juniperi

Pix. Junip.—Cade Oil, Oleum Juniperi Empyreumaticum

Juniper Tar is the empyreumatic volatile oil obtained from the woody portions of *Juniperus Oxycedrus* Linné (Fam. *Pinaceæ*).

Description—Juniper Tar is a dark brown, clear, thick liquid, having a tarry odor and a warm, faintly aromatic, bitter taste.

Solubility—Juniper Tar is very slightly soluble in water. It is only partially soluble in petroleum benzin, but is soluble in 9 volumes of alcohol, and in all proportions in amyl alcohol, in chloroform, and in glacial acetic acid. It is almost completely soluble in 3 volumes of ether with not more than a slight, flocculent residue.

Specific gravity—The specific gravity of Juniper Tar is not less than 0.950 and not more than 1.055.

Identification—Shake 1 part of Juniper Tar with 20 parts of warm water and filter the mixture.

A: A 5-cc. portion of the filtrate blackens silver ammonium nitrate T.S. in the cold.

B: Another 5-cc. portion of the filtrate gives a red precipitate with alkaline cupric tartrate T.S. on heating.

Reaction—The filtrate prepared for the *Identification tests* imparts an acid reaction to moistened blue litmus paper.

Rosin or rosin oils—Triturate 1 cc. of Juniper Tar with 15 cc. of petroleum benzin filter the solution, add an equal volume of cupric acetate solution (1 in 100), shake and allow the liquids to separate. Decant the benzin layer into a test tube, anc add to it an equal volume of ether: the liquid does not become intensely green, and is not darker than brown.

Packaging and storage—Preserve Juniper Tar in tight, light-resistant containers and avoid exposure to excessive heat.

Tar, Pine

PINE TAR

Pix Pini

Pix Pin.—Pix Liquida

Pine Tar is a product obtained by the destructive distillation of the wood of *Pinus palustris* Miller, or of other species of *Pinus* (Fam. *Pinaceæ*).

Description—Pine Tar is a very viscid, blackish brown liquid. It is translucent in thin layers, but becomes granular and opaque with age. It has an empyreumatic, terebinthinate odor, a sharp, empyreumatic taste, and is more dense than water. Its solution is acid to litmus paper.

Solubility—Pine Tar is miscible with alcohol, ether, chloroform, glacial acetic acid, and with fixed and volatile oils. It is slightly soluble in water, the solution being pale yellowish to yellowish brown.

Identification—Shake about 1 cc. of Pine Tar with 10 cc. of water for 10 minutes,

filter, and add 1 drop of ferric chloride T.S. to the filtrate: the mixture has a green color which rapidly changes to brown.

Residue on ignition—Pine Tar yields not more than 0.3 per cent of residue on ignition, page 685.

Packaging and storage—Preserve Pine Tar in well-closed containers.

Tar, Pine, Ointment

PINE TAR OINTMENT

Unguentum Picis Pini

Ung. Pic. Pin.

PINE TAR	500 Gm.
YELLOW WAX	150 Gm.
YELLOW OINTMENT	350 Gm.
To make	1000 Gm.

Melt the yellow wax and the yellow ointment together on a water bath, mix well, remove from the heat, and stir until it congeals. Then add the pine tar (see page 2).

Tartaric Acid

TARTARIC ACID

Acidum Tartaricum

Acid. Tart.

$C_4H_6O_6$

$$\begin{array}{l} HO.CH.COOH \\ \quad\;\; | \\ HO.CH.COOH \end{array}$$

Mol. wt. 150.09

Tartaric Acid, when dried over sulfuric acid for 3 hours, contains not less than 99.7 per cent of $C_4H_6O_6$.

Description—Tartaric Acid occurs as colorless or translucent crystals, or as a white, fine to granular, crystalline powder. It is odorless, has an acid taste, is stable in air, and its solutions are acid to litmus paper.

Solubility—One Gm. of Tartaric Acid dissolves in 0.8 cc. of water and in about 3 cc. of alcohol. One Gm. dissolves in 0.5 cc. of boiling water.

Identification—Tartaric Acid responds to the tests for *Tartrate*, page 663.

Difference from citric acid—When slowly ignited, Tartaric Acid gradually decomposes, emitting an odor resembling that of burning sugar.

Loss on drying—When dried over sulfuric acid for 3 hours, Tartaric Acid loses not more than 0.5 per cent of its weight.

Residue on ignition—Tartaric Acid yields not more than 0.05 per cent of residue on ignition, page 685.

Oxalate—Nearly neutralize 10 cc. of a solution of Tartaric Acid (1 in 10) with ammonia T.S., and add 10 cc. of calcium sulfate T.S.: no turbidity is produced.
Sulfate—Add 3 drops of hydrochloric acid and 1 cc. of barium chloride T.S. to 10 cc. of a solution of Tartaric Acid (1 in 100): no turbidity is produced.
Heavy metals—Dissolve 2 Gm. of Tartaric Acid in 10 cc. of water, and add 1 drop of phenolphthalein T.S., followed by ammonia T.S. until the solution is faintly pink. Dilute to 23 cc. with water, and add 2 cc. of diluted acetic acid: the heavy metals limit, page 657, for Tartaric Acid is 10 parts per million.
Assay—Place about 2 Gm. of Tartaric Acid, previously dried over sulfuric acid for 3 hours and accurately weighed, in an Erlenmeyer flask. Dissolve it in 40 cc. of water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 75.05 mg. of $C_4H_6O_6$. Each Gm. of Tartaric Acid, previously dried over sulfuric acid for 3 hours, consumes not less than 13.28 cc. and not more than 13.40 cc. of normal sodium hydroxide.
Packaging and storage—Preserve Tartaric Acid in well-closed containers.

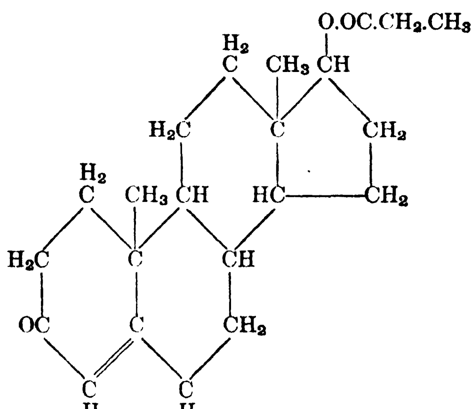
Testosterone, methyl.. 327

Testosterone Propionate

TESTOSTERONE PROPIONATE

Testosteroni Propionas

Testost. Prop.



$C_{22}H_{32}O_3$ Mol. wt. 344.48

Description—Testosterone Propionate occurs as white or slightly yellow crystals or crystalline powder. It is odorless and is stable in air.
Solubility—Testosterone Propionate is insoluble in water; it is freely soluble in alcohol, in ether, and in other organic solvents. It is soluble in vegetable oils.
Melting range—Testosterone Propionate melts between 118° and 122°, page 667.
Specific rotation—The specific rotation, $[\alpha]_D^{25}$, of Testosterone Propionate, determined in a solution in dioxane, containing, in each 10 cc., 100 mg. of Testosterone Propionate, previously dried for 4 hours over sulfuric acid, and using a 100-mm. tube, is not less than +83° and not more than +90°, page 675.

Identification—

A: Reflux 25 mg. of Testosterone Propionate for 1 hour with 2 cc. of a 1 per cent solution of potassium hydroxide in methanol. Cool the mixture, add 10 cc. of water, filter the precipitate, and wash it with water until the washings are neutral. Dry the precipitate in a vacuum at 65° for 3 hours: the testosterone so obtained melts between 151° and 155°.

B: Reflux 25 mg. of Testosterone Propionate for 1 hour with 3.5 cc. of a methanol solution, prepared by dissolving 50 mg. of hydroxylamine hydrochloride and 50 mg. of sodium acetate in 25 cc. of methanol. Precipitate the ketoxime with 15 cc. of water, filter on a fritted glass filter, wash with water, and remove the excess water by suction. Recrystallize the precipitate from 70 per cent methanol: the crystals, after drying at about 100°, melt between 167° and 170°.

C: The ultra-violet absorption coefficient of Testosterone Propionate, measured in petroleum benzin solution, is log E = 4.23 at 2300 Ångströms, page 614.

Packaging and storage—Preserve Testosterone Propionate in well-closed, light-resistant containers.

AVERAGE DOSE—Intramuscular, 25 mg. (approximately 3/8 grain).

TETANUS AND GAS GANGRENE ANTITOXINS

Antitoxina Tetanica et Gas-gangrænosa

Antitox. Tetan. et Gas-gangræn.

Tetanus and Gas Gangrene Antitoxins is a sterile solution of antitoxic substances obtained from the blood of healthy animals which have been immunized against the toxins of *Clostridium tetani*, *Clostridium perfringens* and *Clostridium septicum*. Each package of the Antitoxins contains not less than 1500 units of tetanus antitoxin and not less than 2000 units of each of the other component antitoxins. Tetanus and Gas Gangrene Antitoxins complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Tetanus and Gas Gangrene Antitoxins is a transparent or slightly opalescent liquid of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight granular deposit. It must be free from harmful substances detectable by animal inoculation and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used).

Regulations—The potency of the Antitoxins is expressed in antitoxic units and the units are those of the Tetanus, Perfringens, and Vibrion Septique antitoxins prescribed by the National Institute of Health of the United States Public Health Service.

The outside label must indicate the minimum number of antitoxic units of each antitoxin in the package, the manufacturer's lot number of the Antitoxins, the name, address, and license number of the manufacturer, the genus of animal em-

ployed when other than the horse, and the date beyond which the minimum potency of the contents, as declared on the label, may not be maintained.

Preservation and storage—Preserve Tetanus and Gas Gangrene Antitoxins at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, prophylactic, the contents of one or more packages.

Tetanus Antitoxin

TETANUS ANTITOXIN

Antitoxinum Tetanicum

Antitox. Tetan.

Tetanus Antitoxin is a sterile solution of antitoxic substances obtained from the blood serum or plasma of a healthy animal which has been immunized against tetanus toxin. Tetanus Antitoxin has a potency of not less than 400 antitoxic units per cc.* Tetanus Antitoxin complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Tetanus Antitoxin is a transparent or slightly opalescent liquid, of a faint brownish, yellowish, or greenish color, nearly odorless or having an odor due to the presence of a preservative; it may have a slight, granular deposit. Tetanus Antitoxin must be free from harmful substances detectable by animal inoculation, and must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used), and its total solids must not exceed 20 per cent.

Regulations—The potency of the Antitoxin is expressed in antitoxic units, and the unit is that of the standard Tetanus Antitoxin distributed by the National Institute of Health of the United States Public Health Service.

The outside label must bear the name *Tetanus Antitoxin* and must indicate the minimum number of antitoxic units in the package, the manufacturer's lot number of the Antitoxin, the name, address, and license number of the manufacturer, the genus of animal employed when other than the horse, and the date beyond which the minimum potency of contents, as declared on the label, may not be maintained. This date is 1 year from the date of issue from the manufacturing establishment if at the time the Antitoxin was placed in the container it had an excess of 20 per cent over the declared minimum potency, 2 years for a 30 per cent excess, 3 years for a 40 per cent excess, or 4 years for a 50 per cent excess.

Packaging and storage—Preserve Tetanus Antitoxin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Parenteral, therapeutic, 20,000 units; prophylactic, 1500 units.

* The unit of potency for Tetanus Antitoxin referred to in this Pharmacopœia is known as the "American Unit"; it is approximately double the strength of the "International Unit" established by the Permanent Standards Commission of the Health Organization of the League of Nations.

TETANUS TOXOID

Toxoidum Tetanicum

Toxoid. Tetan.

Tetanus Toxoid is a sterile solution of the products of growth of the tetanus bacillus (*Clostridium tetani*) so modified by special treatment as to have lost the ability to cause toxic effects in guinea pigs but retaining the property of inducing active immunity.

The toxicity of Tetanus Toxoid shall be so low that 5 cc. of the material does not cause any symptoms of tetanus in a guinea pig within a period of 21 days after its injection into the animal. The antigenic value is such that 1 cc. of the material shall, 6 weeks after injection, protect at least 80 per cent of the guinea pigs used from all symptoms of tetanus for a period of 10 days after the injection of 10 minimum lethal doses of tetanus test toxin into each animal.

Tetanus Toxoid complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Tetanus Toxoid is a clear, brownish yellow, or slightly turbid liquid having a characteristic odor or an odor due to the presence of a preservative. Tetanus Toxoid must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol if either of these is used), and must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Tetanus Toxoid*, the manufacturer's lot number of the Toxoid, the name, address, and license number of the manufacturer, and the date beyond which the Toxoid may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Tetanus Toxoid at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, 1 cc., or 0.5 cc. (whichever is specified on the label) to be repeated twice at intervals of approximately 3 weeks.

ALUM PRECIPITATED TETANUS TOXOID

Toxoidum Tetanicum Alumen-præcipitatum

Toxoid. Tetan. Alumen-præcip.

Alum Precipitated Tetanus Toxoid is a sterile suspension of tetanus toxoid, precipitated with alum from a solution in which the products of

growth of the tetanus bacillus (*Clostridium tetani*) have developed and have been so modified by special treatment as to have lost the ability to cause toxic effects in guinea pigs, but retaining the property of inducing active immunity.

Alum Precipitated Tetanus Toxoid complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Alum Precipitated Tetanus Toxoid is a turbid, white, slightly gray, or slightly pink suspension prepared by adding a sterile solution of alum to Tetanus Toxoid, washing the resultant precipitate with isotonic sodium chloride solution, and resuspending it in isotonic sodium chloride solution to which a suitable preservative may be added.

The volume of Alum Precipitated Tetanus Toxoid intended for human injection, when injected subcutaneously into normal guinea pigs weighing approximately 500 Gm., shall produce at least 2 units of antitoxin per cc. of blood serum in not more than 6 weeks when aliquot portions of serum from not less than four guinea pigs are pooled.

The finished product contains not more than 20 mg. of alum per individual human injection, the calculation being based on the total amount of alum added for precipitation, or not more than 15 mg. of alum per individual human injection, as determined by assay of the finished product.

Regulations—The outside label must bear the name *Alum Precipitated Tetanus Toxoid*, the manufacturer's lot number of the Toxoid, the name, address, and license number of the manufacturer, and the date beyond which the Toxoid may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Alum Precipitated Tetanus Toxoid at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

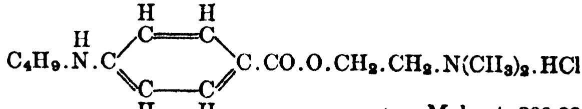
AVERAGE DOSE—Hypodermic, for active immunization, 1 cc. or 0.5 cc. (whichever is specified on the label) to be repeated once with an interval of 4 to 6 weeks.

Tetracaine Hydrochloride

TETRACAINE HYDROCHLORIDE

Tetracainæ Hydrochloridum

Tetracain. Hydrochlor.—Amethocaine Hydrochloride



$C_{15}H_{24}N_2O_2.HCl$ Mol. wt. 300.82

Tetracaine Hydrochloride, when dried over sulfuric acid for 4 hours, contains not less than 86.5 per cent and not more than 88.5 per cent of $C_{15}H_{24}N_2O_2$, corresponding to not less than 98.4 per cent of $C_{15}H_{24}N_2O_2.HCl$.

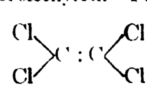
Description—Tetracaine Hydrochloride occurs as a fine, white, crystalline, odorless powder. It has a slightly bitter taste followed by a sense of numbness. Its solution is neutral to litmus paper.
Solubility—Tetracaine Hydrochloride is very soluble in water and soluble in alcohol. It is insoluble in ether and in benzene.
Melting range—Tetracaine Hydrochloride melts between 147° and 150°, page 667.
Identification—
A: Dissolve 100 mg. of Tetracaine Hydrochloride in 10 cc. of water and add 1 cc. of a solution of potassium thiocyanate (1 in 4): a crystalline precipitate is obtained which, when recrystallized from water and dried at 80°, melts between 130° and 132°.
B: A solution of 100 mg. of Tetracaine Hydrochloride in 5 cc. of water responds to the tests for *Chloride*, page 663.
C: Dissolve about 100 mg. of Tetracaine Hydrochloride in 10 cc. of water, add 0.2 cc. of diluted hydrochloric acid and 0.2 cc. of a solution of sodium nitrite (1 in 10), and gradually add the mixture to a solution of 200 mg. of beta-naphthol in 10 cc. of sodium hydroxide T.S.: a white precipitate is formed, but no color develops.
Loss on drying—When dried over sulfuric acid for 4 hours, Tetracaine Hydrochloride loses not more than 1 per cent of its weight.
Residue on ignition—Tetracaine Hydrochloride yields not more than 0.1 per cent of residue on ignition, page 685.
Assay—Transfer about 300 mg. of Tetracaine Hydrochloride, previously dried over sulfuric acid for 4 hours and accurately weighed, to a separator, add 25 cc. of water, make alkaline with sodium hydroxide T.S., and extract with 7 portions of ether, using 35 cc., 30 cc., 25 cc., 20 cc., 15 cc., 10 cc., and 10 cc., respectively. Wash the combined ether extracts with 15 cc. of water, filter the ether solution through cotton, and wash the vessel and filter with two 10-cc. portions of ether. Evaporate the combined ether solutions of $C_{15}H_{24}N_2O_2$ to a thick oil with the aid of a current of warm air, and dry to constant weight over sulfuric acid.
Packaging and storage—Preserve Tetracaine Hydrochloride in tight, light-resistant containers.

Tetrachloroethylene

TETRACHLOROETHYLENE

Tetrachloroæthylenum

Tetrachloroæthylen.—Perchloroethylene



C_2Cl_4 Mol. wt. 165.85

Tetrachloroethylene contains not less than 99 per cent and not more than 99.5 per cent of C_2Cl_4, the remainder consisting of alcohol.

Description—Tetrachloroethylene is a clear, colorless, mobile liquid having a characteristic, ethereal odor. It is not inflammable. It is slowly decomposed by light and by various metals in the presence of moisture.
Solubility—Tetrachloroethylene is practically insoluble in water. It is miscible with an equal volume of alcohol, with ether, chloroform, petroleum benzin, and benzene, and dissolves most of the fixed and volatile oils.
Specific gravity—The specific gravity of Tetrachloroethylene is between 1.603 and 1.615, indicating not less than 99 per cent and not more than 99.5 per cent of C_2Cl_4.

Boiling range—Not less than 90 per cent of Tetrachloroethylene distils between 118° and 122°, page 624.

Acid—In each of two 50-cc. glass-stoppered cylinders of colorless glass, having an internal diameter of 20 mm., place 10 cc. of water, 2 drops of phenolphthalein T.S., and enough hundredth-normal sodium hydroxide to produce, after shaking, pink tints of equal intensity. Into one of the cylinders measure exactly 20 cc. of Tetrachloroethylene, and again shake thoroughly. Add hundredth-normal sodium hydroxide, dropwise, shaking well after each addition, until the pink color is reproduced in an intensity equal to that in the cylinder without the Tetrachloroethylene: not more than 0.5 cc. of hundredth-normal sodium hydroxide is required to produce a pink color which persists for 5 minutes.

Nonvolatile residue—Evaporate 50 cc. of Tetrachloroethylene to dryness in a tared dish on a water bath, and dry the residue to constant weight at 100°: the weight of the residue does not exceed 1 mg.

Chloride ion—Shake 25 cc. of Tetrachloroethylene with an equal volume of water for 5 minutes, and allow the liquids to separate completely. To 10 cc. of the water layer add 5 drops of silver nitrate T.S. and 1 drop of nitric acid: no turbidity results.

Readily carbonizable substances—Place 20 cc. of Tetrachloroethylene in a glass-stoppered cylinder which has been previously moistened with sulfuric acid. Add 5 cc. of sulfuric acid, shake vigorously for 5 minutes, and allow the two liquids to separate completely: the acid layer is colorless or shows no more color than matching fluid A, page 680.

Phosgene—Place 20 cc. of Tetrachloroethylene in a glass-stoppered container, and add 100 mg. of benzidine. Stopper the container, and allow to stand in the dark for 24 hours: the solution shows no turbidity or flocculence and is not more deeply colored than matching fluid H, page 680.

Packaging and storage—Preserve Tetrachloroethylene in tight, light-resistant containers.

AVERAGE DOSE—3 cc. (approximately 45 minims).

Tetrachloroethylene Capsules

TETRACHLOROETHYLENE CAPSULES

Capsulæ Tetrachloroæthyleni

Cap. Tetrachloroæthylen.

Tetrachloroethylene Capsules contain not less than 94 per cent and not more than 106 per cent of the labeled amount of C_2Cl_4.

Identification—Shake the tetrachloroethylene obtained in the *Assay* with about 1 Gm. of anhydrous sodium sulfate, and filter through a pledget of dry purified cotton into a dry flask. The filtrate has a specific gravity of 1.603 to 1.615, and not less than 90 per cent of it distils between 116° and 122°.

Assay—Place in the flask of a toluene moisture apparatus, page 712, having a graduated receiving tube of 20-cc. capacity, a sufficient number of Tetrachloroethylene Capsules to yield about 15 cc. of tetrachloroethylene. Add 25 cc. of glycerin, and heat the flask with a small flame until the lower layer in the receiving tube does not increase. Cool the receiving tube to 25°, and adjust the meniscus, if necessary, by washing the walls with a spray of about 2 cc. of water. The volume of the lower layer represents the volume of tetrachloroethylene in the number of Capsules taken for the assay.

Packaging and storage—Preserve Tetrachloroethylene Capsules preferably at a temperature which does not exceed 35°.

Sizes—Tetrachloroethylene Capsules usually available contain the following amounts of tetrachloroethylene: 0.2, 1, and 2.5 cc. (3, 15, and 40 minims).

AVERAGE DOSE OF TETRACHLOROETHYLENE—**3 cc.** (approximately 45 minims).

THEOBROMA OIL

Oleum Theobromatis

Ol. Theobrom.—Cacao Butter, Cocoa Butter

Theobroma Oil is the fat obtained from the roasted seed of *Theobroma Cacao* Linné (Fam. *Sterculiaceæ*).

Description—Theobroma Oil is a yellowish white solid, having a faint, agreeable odor, and a bland, chocolate-like taste if the Oil is obtained by pressing. If obtained by extraction, the taste is bland. Theobroma Oil is usually brittle at temperatures below 25°.

Solubility—Theobroma Oil is slightly soluble in alcohol, soluble in boiling dehydrated alcohol, and freely soluble in ether and in chloroform.

Specific gravity—The specific gravity of Theobroma Oil is not less than 0.858 and not more than 0.864 at $\frac{100°}{25°}$.

Refractive index—The refractive index of Theobroma Oil is not less than 1.4537 and not more than 1.4585 at 40°, page 682.

Wax, stearin, or tallow—Dissolve 1 Gm. of Theobroma Oil in 3 cc. of ether in a test tube at a temperature of 17°, and immerse the tube in a mixture of ice and water: the solution does not become turbid or deposit white flakes in less than 3 minutes. After the oil has congealed, raise the temperature to 15°: a clear liquid is gradually formed.

Iodine value—The iodine value of Theobroma Oil is not less than 35 and not more than 40, page 647.

Saponification value—The saponification value of Theobroma Oil is not less than 188 and not more than 195, page 647.

Solidification range of the fatty acids—The solidification temperature of the mixed fatty acids of Theobroma Oil is not below 45° and not above 50°, page 645.

Packaging and storage—Preserve Theobroma Oil in well-closed containers.

THEOBROMINE AND SODIUM ACETATE

Theobromina et Sodii Acetas

Theobrom. et Sod. Acet.

Theobromine and Sodium Acetate is a hydrated mixture of theobromine sodium ($C_7H_7N_4O_2Na$) and sodium acetate ($NaC_2H_3O_2$) in approximately molecular proportions. It yields not less than 55 per cent and not more than 65 per cent of theobromine ($C_7H_8N_4O_2$).

Description—Theobromine and Sodium Acetate is a white, crystalline powder, which

is odorless or practically odorless. It has a bitter taste. It is moderately hygroscopic, and on exposure to air gradually absorbs carbon dioxide with the liberation of theobromine. Its solutions are alkaline to phenolphthalein T.S.

Solubility—One Gm. of Theobromine and Sodium Acetate dissolves in about 1.5 cc. of water. It is slightly soluble in alcohol. Even weak acids precipitate the theobromine from a water solution.

Identification—

A: To about 50 mg. of the precipitate obtained in the *Assay*, add 1 cc. of hydrochloric acid and about 100 mg. of potassium chlorate, and evaporate to dryness on a water bath: when the dish is inverted over a vessel containing a few drops of ammonia T.S. the residue acquires a purple color, which is destroyed by solutions of fixed alkalies.

B: When ignited, Theobromine and Sodium Acetate yields a residue which colors a non-luminous flame an intense yellow and effervesces with acids.

C: To a solution of 500 mg. of Theobromine and Sodium Acetate add 2 cc. of diluted sulfuric acid, and filter: the filtrate responds to the tests for *Acetate*, page 658.

Alkalinity—Dissolve about 1 Gm. of Theobromine and Sodium Acetate, accurately weighed, in 10 cc. of freshly boiled and cooled water, and titrate the solution with normal hydrochloric acid, using phenolphthalein T.S. as the indicator. Not more than 3.6 cc. of the hydrochloric acid is required per Gm. of Theobromine and Sodium Acetate.

Color and completeness of solution—A freshly prepared solution of Theobromine and Sodium Acetate (1 in 20) in freshly boiled and cooled water is colorless or nearly colorless, and is clear or not more than opalescent.

Caffeine—Dissolve 1 Gm. of Theobromine and Sodium Acetate in 10 cc. of water, add a few drops of sodium hydroxide T.S., and shake the mixture with 10 cc. of chloroform. Separate the chloroform layer, evaporate it to dryness on a water bath, and dry for 1 hour at 80°: the weight of the residue so obtained does not exceed 5 mg.

Assay—Weigh accurately from 2 Gm. to 2.2 Gm. of Theobromine and Sodium Acetate, and dissolve it in 10 cc. of water in a small dish. Add to the solution 2 drops of phenolphthalein T.S., then add normal hydrochloric acid until the red color is just discharged. The solution should now be slightly alkaline to litmus; if it is not alkaline to litmus, make it so by the addition of 1 or 2 drops of very dilute ammonia T.S. Allow to stand at 20° to 25° for 3 hours, stirring occasionally. Transfer the precipitate of theobromine to a tared filtering crucible, wash the dish and precipitate with four successive portions of 5 cc. each of ice-cold water, then dry to constant weight at 100°, and to the weight of theobromine thus obtained add 15 mg. (the approximate quantity of theobromine remaining in the filtrate and washings).

About 200 mg. of the precipitate obtained in the *Assay* leaves only a negligible residue on ignition.

Packaging and storage—Preserve Theobromine and Sodium Acetate in tight, light-resistant containers.

AVERAGE DOSE—**0.5 Gm.** (approximately $7\frac{1}{2}$ grains).

Theobromine and Sodium Acetate Capsules

THEOBROMINE AND SODIUM ACETATE CAPSULES

Capsulæ Theobrominæ et Sodii Acetatis

Cap. Theobrom. et Sod. Acet.

Theobromine and Sodium Acetate Capsules contain an amount of

theobromine, $C_7H_8N_4O_2$, equivalent to not less than 53 per cent and not more than 67 per cent of the labeled amount of theobromine and sodium acetate.

Identification—

A: The theobromine obtained in the *Assay* responds to *Identification test A*, under *Theobromine and Sodium Acetate*, page 563.

B: The filtrate obtained in the *Assay* responds to the tests for *Acetate*, page 658.

Assay—Transfer as completely as possible the contents of a sufficient counted number of Theobromine and Sodium Acetate Capsules, to yield about 10 Gm. of theobromine and sodium acetate, to a 50-cc. volumetric flask. Place the emptied capsules in a small beaker, add just sufficient ice-cold water to cover them, and allow to stand for 10 minutes. Pour off the liquid into the volumetric flask, and wash the capsules with small quantities of ice-cold water, adding the washings to the flask. Add sodium hydroxide T.S. to the flask until the solution is clear or nearly so, then dilute to 50 cc. with water, and mix well.

Transfer exactly 10 cc. of this solution to a small dish, add 2 drops of phenolphthalein T.S., then add normal hydrochloric acid until the red color is just discharged. The solution should now be slightly alkaline to litmus; if it is not alkaline to litmus, make it so by the addition of 1 or 2 drops of very dilute ammonia T.S. Allow the mixture to stand at 20° to 25° for 3 hours, stirring occasionally. Completely transfer the precipitate of theobromine to a tared filtering crucible, and wash the dish and the precipitate with four successive portions of 5 cc. each of cold water, then dry to constant weight at 100°, and to the weight of the theobromine thus obtained add 15 mg. (the approximate quantity of theobromine remaining in the filtrate).

About 200 mg. of the theobromine obtained in the *Assay* leaves only a negligible residue on ignition.

Packaging and storage—Preserve Theobromine and Sodium Acetate Capsules in well-closed containers.

Sizes—Theobromine and Sodium Acetate Capsules usually available contain the following amounts of theobromine and sodium acetate: 100 and 200 mg. (1½ and 3 grains).

AVERAGE DOSE OF THEOBROMINE AND SODIUM ACETATE—
0.5 Gm. (approximately 7½ grains).

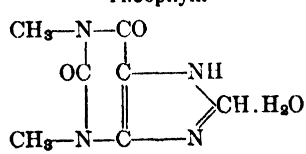
Theophylline

THEOPHYLLINE

Theophyllina

Theophyll.

$C_7H_8N_4O_2.H_2O$



Mol. wt. 198.18

Description—Theophylline occurs as a white, crystalline powder, without odor, and has a bitter taste. It is stable in air.

Solubility—One Gm. of Theophylline dissolves in about 120 cc. of water and in about 80 cc. of alcohol. It is more soluble in hot water; sparingly soluble in ether or chloroform. It is freely soluble in solutions of alkali hydroxides and in ammonia.

Melting range—Theophylline melts between 270° and 274°, page 667.

Identification—

A: To about 10 mg. of Theophylline, contained in a porcelain dish, add 1 cc. of hydrochloric acid and 100 mg. of potassium chlorate, and evaporate to dryness on a water bath: when the dish is inverted over a vessel containing a few drops of ammonia T.S., the residue acquires a purple color, which is destroyed by solutions of fixed alkalies.

B: A saturated solution of Theophylline yields with tannic acid T.S. a precipitate which is soluble in an excess of the reagent.

Acid—Dissolve 500 mg. of Theophylline in 75 cc. of water and add 1 drop of methyl red T.S.: not more than 1.0 cc. of fiftieth-normal sodium hydroxide is required to change the red color to yellow.

Loss on drying—When dried to constant weight at 100°, Theophylline loses not more than 9.5 per cent of its weight.

Residue on ignition—Theophylline yields not more than 0.15 per cent of residue on ignition, page 685.

Readily carbonizable substances—Dissolve 200 mg. of Theophylline in 5 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Difference from caffeine, theobromine, or paraxanthine—A clear solution is produced when 200 mg. of Theophylline is dissolved in 5 cc. of potassium hydroxide T.S. or in 5 cc. of ammonia T.S.

Packaging and storage—Preserve Theophylline in well-closed containers.

AVERAGE DOSE—**0.2 Gm.** (approximately 3 grains).

Theophylline Tablets

THEOPHYLLINE TABLETS

Tabellæ Theophyllinæ

Tab. Theophyll.

Theophylline Tablets contain not less than 94 per cent and not more than 106 per cent of the labeled amount of $C_7H_8N_4O_2.H_2O$.

Identification—Triturate a quantity of finely powdered Theophylline Tablets, equivalent to about 500 mg. of theophylline, with 10- and 5-cc. portions of petroleum benzin, and discard the petroleum benzin. Triturate the residue with two 10-cc. portions of a mixture of equal volumes of ammonia T.S. and water, and filter each time. Evaporate the combined filtrates to about 5 cc., neutralize if necessary with acetic acid, using litmus paper, then cool to about 15°, with stirring. Collect the precipitate on a filter, wash it well with cold water, and dry at about 100°. The theophylline so obtained melts between 270° and 274°, page 667, and responds to the *Identification tests* under *Theophylline*, page 565.

Assay—Place 20 Theophylline Tablets in a 200-cc. volumetric flask, add 50 cc. of water, and when the tablets have disintegrated add 50 cc. of ammonia T.S. Shake until no more dissolves, then add water to the 200-cc. mark, mix well, and filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. Transfer an accurately measured aliquot of the filtrate, equivalent to about 250 mg. of theophylline, to a 250-cc. Erlenmeyer flask, then add exactly 20 cc. of tenth-normal silver nitrate, and heat on a steam bath for 15 minutes. Filter through a filtering

crucible under reduced pressure, and wash the precipitate three times with 10-cc. portions of water. Acidify the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 19.82 mg. of $C_7H_8N_4O_2 . H_2O$.

Packaging and storage—Preserve Theophylline Tablets in well-closed containers.

Sizes—Theophylline Tablets usually available contain the following amounts of theophylline: 100 and 200 mg. (1½ and 3 grains).

AVERAGE DOSE OF THEOPHYLLINE—**0.2 Gm.** (approximately 3 grains).

THEOPHYLLINE AND SODIUM ACETATE

Theophyllina et Sodii Acetas

Theophyll. et Sod. Acet.—Theophylline with Sodium Acetate

Theophylline and Sodium Acetate is a hydrated mixture of theophylline sodium ($C_7H_7N_4O_2Na$) and sodium acetate ($NaC_2H_3O_2$) in approximately molecular proportions. It yields not less than 55 per cent and not more than 65 per cent of anhydrous theophylline ($C_7H_8N_4O_2$).

Description—Theophylline and Sodium Acetate occurs as a white, crystalline powder. It is odorless, and has a bitter, salty taste. It gradually absorbs carbon dioxide from the air with the liberation of free theophylline. Its solutions are alkaline to phenolphthalein T.S.

Solubility—One Gm. of Theophylline and Sodium Acetate dissolves in 25 cc. of water. It is insoluble in alcohol, in ether, and in chloroform.

Identification—

A: Dissolve about 1 Gm. of Theophylline and Sodium Acetate in 20 cc. of warm water, and neutralize with diluted acetic acid: a white crystalline precipitate of theophylline is produced. Filter, wash the precipitate with small portions of cold water, and dry it at 100°: the dried precipitate meets the requirements of *Identification tests A* and *B* under *Theophylline*, page 565, and melts between 270° and 274°, page 667.

B: Suspend about 100 mg. of Theophylline and Sodium Acetate in 2 cc. of 70 per cent alcohol, add 5 drops of sulfuric acid, and boil gently: the mixture evolves the characteristic odor of ethyl acetate.

C: When ignited, Theophylline and Sodium Acetate yields a residue which colors a non-luminous flame intensely yellow and effervesces with acids.

Caffeine—Dissolve 500 mg. of Theophylline and Sodium Acetate in 15 cc. of water in a small separator, add 10 cc. of sodium hydroxide T.S., and shake the mixture with 10 cc. of chloroform. Separate the chloroform layer, wash it with 2 cc. of water, evaporate the chloroform in a tared dish on a water bath, and dry the residue at 80°: the residue weighs not more than 2.5 mg.

Assay—Proceed as directed for the *Assay for theophylline* under *Aminophylline*, page 30, using about 300 mg. of Theophylline and Sodium Acetate, accurately weighed: the weight of anhydrous theophylline found is not less than 55 per cent and not

more than 65 per cent of the weight of Theophylline and Sodium Acetate taken. Each cc. of tenth-normal silver nitrate is equivalent to 18.02 mg. of $C_7H_8N_4O_2$.

Packaging and storage—Preserve Theophylline and Sodium Acetate in tight containers.

AVERAGE DOSE—**0.2 Gm.** (approximately 3 grains).

Theophylline and Sodium Acetate Tablets

THEOPHYLLINE AND SODIUM ACETATE TABLETS

Tabellæ Theophyllinæ et Sodii Acetatis

Tab. Theophyll. et Sod. Acet.

Theophylline and Sodium Acetate Tablets contain an amount of anhydrous theophylline ($C_7H_8N_4O_2$) corresponding to not less than 53 per cent and not more than 67 per cent of the labeled amount of theophylline and sodium acetate.

Identification—Macerate a quantity of powdered Theophylline and Sodium Acetate Tablets, equivalent to about 1 Gm. of theophylline, with 20 cc. of water and 1 cc. of ammonia T.S., and filter. Neutralize the clear filtrate to litmus paper with diluted hydrochloric acid: a white precipitate of theophylline is formed. Cool, collect the precipitate on a filter, wash it with small portions of cold water until free of chloride, and dry at about 100°. The theophylline so obtained melts between 270° and 274°, page 667, and responds to *Identification test A* under *Theophylline*, page 565. To 5 cc. of the first filtrate from the precipitate of the theophylline, add 3 cc. of alcohol and 0.5 cc. of sulfuric acid, and boil gently: the odor of ethyl acetate is evolved.

Assay—Place 20 Theophylline and Sodium Acetate Tablets in a 200-cc. volumetric flask, add 50 cc. of water and 10 cc. of ammonia T.S., and allow to stand with frequent shaking for 30 minutes or until no more dissolves. Dilute to 200 cc. with water, mix well, and filter. Transfer an accurately measured aliquot of the filtrate, equivalent to about 350 mg. of theophylline and sodium acetate, to a 250-cc. Erlenmeyer flask, and add 8 cc. of ammonia T.S. and exactly 20 cc. of tenth-normal silver nitrate. Heat on a steam bath for 15 minutes, then filter through a filtering crucible under reduced pressure, and wash the precipitate three times with 10-cc. portions of water. Acidify the combined filtrate and washings with nitric acid, and add an excess of 3 cc. of the acid. Cool, add 2 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Each cc. of tenth-normal silver nitrate is equivalent to 18.02 mg. of $C_7H_8N_4O_2$.

Packaging and storage—Preserve Theophylline and Sodium Acetate Tablets in tight containers.

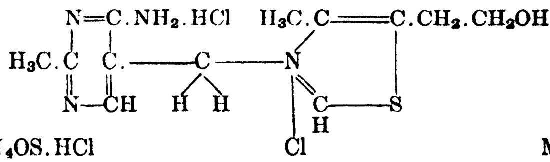
Sizes—Theophylline and Sodium Acetate Tablets usually available contain the following amounts of theophylline and sodium acetate: 100 and 200 mg. (1½ and 3 grains).

AVERAGE DOSE OF THEOPHYLLINE AND SODIUM ACETATE—**0.2 Gm.** (approximately 3 grains).

THIAMINE HYDROCHLORIDE

Thiaminæ Hydrochloridum

Thiamin. Hydrochlor.—Thiamin Chloride, Vitamin B_1 Hydrochloride, Vitamin B_1, Aneurine Hydrochloride



$C_{12}H_{17}ClN_4OS.HCl$ Mol. wt. 337.27

Thiamine Hydrochloride, when dried at 100° for 3 hours, contains not less than 98 per cent of $C_{12}H_{17}ClN_4OS.HCl$.

Description—Thiamine Hydrochloride occurs as small, white crystals, or as a crystalline powder, usually having a slight, characteristic odor. When exposed to air, the anhydrous product rapidly absorbs about 4 per cent of water. Its solutions are acid to litmus paper.

Solubility—One Gm. of Thiamine Hydrochloride dissolves in about 1 cc. of water, and in about 100 cc. of alcohol. It is soluble in glycerin, and is insoluble in ether and in benzene.

Identification—

A: A solution of Thiamine Hydrochloride yields a white precipitate with mercury bichloride T.S., and a red brown precipitate with iodine T.S. It is also precipitated by mercuric-potassium iodide T.S., and by trinitrophenol T.S.

B: Dissolve about 5 mg. of Thiamine Hydrochloride in a mixture of 1 cc. of lead acetate T.S. and 1 cc. of a solution of sodium hydroxide (1 in 10): a yellow color is produced. On being heated for several minutes on a steam bath the color of the mixture changes to brown, and on standing, a precipitate of lead sulfide separates.

C: Dissolve about 5 mg. of Thiamine Hydrochloride in 5 cc. of half-normal sodium hydroxide, add 0.5 cc. of potassium ferricyanide T.S. and 5 cc. of isobutyl alcohol, shake the mixture vigorously for 2 minutes, and allow the liquid layers to separate: when illuminated by a vertical beam of light entering from above and viewed at a right angle to this beam, the uppermost meniscus of the top layer shows a vivid blue fluorescence, which disappears when the mixture is slightly acidified, but reappears when it is again made alkaline.

D: A solution of Thiamine Hydrochloride (1 in 50) responds to the tests for *Chloride*, page 659.

Loss on drying—Dry about 500 mg. of Thiamine Hydrochloride, accurately weighed, at 100° for 3 hours: the loss in weight is not more than 5 per cent.

Residue on ignition—Thiamine Hydrochloride yields not more than 0.2 per cent of residue on ignition, page 685.

Color of solution—Dissolve 1.0 Gm. of Thiamine Hydrochloride in sufficient water to make 10 cc. This solution exhibits no more color than a dilution of 1.5 cc. of tenth-normal potassium dichromate in sufficient water to make 1000 cc.

Sulfate—To 5 cc. of a solution of Thiamine Hydrochloride (1 in 100), add 0.5 cc. of diluted hydrochloric acid and 0.5 cc. of barium chloride T.S.: no turbidity is produced within 5 minutes.

Limit of hydrogen chloride—Weigh accurately about 250 mg. of Thiamine Hydrochloride obtained in the test for *Loss on drying*, dissolve it in 20 cc. of recently boiled and cooled water, add 1 drop of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide to a pink color: not less than 28 cc. and not more than

30.5 cc. of tenth-normal sodium hydroxide are required per Gm. of Thiamine Hydrochloride.

Assay—Weigh accurately from 50 to 60 mg. of the dried Thiamine Hydrochloride obtained in the test for *Loss on drying*, dissolve it in sufficient water to make 1000 cc., and mix well. Transfer exactly 10 cc. of this solution to a 500-cc. volumetric flask, dilute with water to exactly 500 cc., and mix well. Prepare *Thiamine Hydrochloride Standard Solution* from U. S. P. Thiamine Hydrochloride Reference Standard, previously dried at 100° for 3 hours, as described under the *Thiamine Assay, Thiochrome Method*, page 705. Oxidize the assay solution and the thiamine hydrochloride standard solution, and measure the intensity of fluorescence of the oxidized solutions as there described. The fluorescence of the Thiamine Hydrochloride under examination corresponds to not less than 98 per cent of the fluorescence of the U. S. P. Thiamine Hydrochloride Reference Standard.

Packaging and storage—Preserve Thiamine Hydrochloride in tight, light-resistant containers.

AVERAGE DOSE—To be determined by the physician according to the needs of the patient.

NOTE—Unofficial preparations containing thiamine hydrochloride may be assayed as directed under *Thiamine Assay, Biological Method*, page 703.

Thiamine Hydrochloride Injection

THIAMINE HYDROCHLORIDE INJECTION

Injectio Thiaminæ Hydrochloridi

Inj. Thiamin. Hydrochlor.

Thiamine Hydrochloride Injection is a sterile solution of thiamine hydrochloride in water for injection. It contains not less than 95 per cent and not more than 115 per cent of the labeled amount of $C_{12}H_{17}ClN_4OS.HCl$. It meets the requirements of the *Sterility Test for Liquids*, page 689.

Sterilize Thiamine Hydrochloride Injection preferably by Process C or Process F. See *Sterilization Processes*, page 692.

The Injection also conforms to the other requirements under *Injections*, page 664.

Identification—The Injection responds to *Identification Tests A*, *C*, and *D*, under *Thiamine Hydrochloride*, page 569.

Assay—Transfer an accurately measured volume of the Injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, equivalent to about 50 mg. of thiamine hydrochloride, to a 1000-cc. volumetric flask, fill to the mark with water, and mix well. Transfer exactly 10 cc. of this dilution to a 500-cc. volumetric flask, dilute to the 500-cc. mark with water, and mix well.

Prepare a *Thiamine Hydrochloride Standard Solution* from U. S. P. Thiamine

Hydrochloride Reference Standard, previously dried at 100° for 3 hours, as described under *Thiamine Assay, Thiochrome Method*, page 705.

Oxidize the assay solution and the Thiamine Hydrochloride Standard Solution and measure the intensity of fluorescence of the oxidized solutions as described under the *Thiamine Assay, Thiochrome Method*, page 705. The fluorescence of the Injection under examination corresponds to not less than 95 per cent, and not more than 115 per cent of the fluorescence of the equivalent quantity of the U. S. P. Thiamine Hydrochloride Reference Standard.

Packaging and storage—Preserve Thiamine Hydrochloride Injection in hermetic or other suitable containers. See *Containers for Injections*, page 630.

Sizes—Thiamine Hydrochloride Injection usually available contains the following amounts of thiamine hydrochloride: 5 mg. (1/12 grain) in 1 cc.; 10 mg. (1/6 grain) in 1 cc.; 50 mg. (3/4 grain) in 1 cc.; 0.25 Gm. (4 grains) in 10 cc.; 0.5 Gm. (7½ grains) in 10 cc.; 1 Gm. (15 grains) in 10 cc.; 1.5 Gm. (22½ grains) in 10 cc.

AVERAGE DOSE OF THIAMINE HYDROCHLORIDE—To be determined by the physician according to the needs of the patient.

Thiamine Hydrochloride Tablets

THIAMINE HYDROCHLORIDE TABLETS

Tabellæ Thiaminæ Hydrochloridi

Tab. Thiamin. Hydrochlor.—Thiamin Chloride Tablets, Vitamin B_1 Tablets

Thiamine Hydrochloride Tablets contain not less than 95 per cent and not more than 120 per cent of the labeled amount of $C_{12}H_{17}ClN_4OS.HCl$.

Identification—

A: Triturate a quantity of powdered Thiamine Hydrochloride Tablets, equivalent to about 10 mg. of thiamine hydrochloride, with 10 cc. of water, and filter. To 2 cc. of the filtrate add 2 cc. of half-normal sodium hydroxide, 0.2 cc. of potassium ferricyanide T.S. and 2 cc. of isobutyl alcohol. Shake the mixture vigorously for 2 minutes, and allow the liquids to separate: when illuminated by a vertical beam of light entering from above and viewed at a right angle to this beam, the uppermost meniscus of the top layer shows a vivid blue fluorescence, which disappears when the mixture is slightly acidified, but reappears when it is again made alkaline.

B: Separate, 2-cc. portions of the filtrate, prepared for the preceding test, yield a red brown precipitate with iodine T.S., a white precipitate with mercury bichloride T.S., and respond to *Identification tests B* and *D* under *Thiamine Hydrochloride*, page 569.

Assay—Weigh a counted number of not less than 10 Thiamine Hydrochloride Tablets and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powder, equivalent to 10 mg. of thiamine hydrochloride, transfer it completely to a 1000-cc. volumetric flask with the aid of water, add 10 cc. of normal sulfuric acid, agitate for 15 minutes, and add sufficient water to make 1000 cc., mix well, and filter. Dilute exactly 50 cc. of the filtrate with sufficient water to make 500 cc., and mix well. Using exactly 2 cc. of this solution, proceed as directed under *Thiamine Assay Thiochrome Method*, page 705, beginning with the words "Then add, with mixing, 3 cc. of oxidizing solution" under *Oxidation of Thiamine to Thiochrome and Measurement of Fluorescence*.

Packaging and storage—Preserve Thiamine Hydrochloride Tablets in tight containers.

Sizes—Thiamine Hydrochloride Tablets usually available contain the following amounts of thiamine hydrochloride: 3, 5, and 10 mg. (1/20, 1/12, and 1/6 grain).

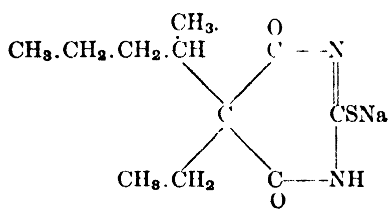
AVERAGE DOSE OF THIAMINE HYDROCHLORIDE—To be determined by the physician according to the needs of the patient.

Thiopental Sodium

THIOPENTAL SODIUM

Thiopentalum Sodicum

Thiopental. Sod.—Thiopentone Soluble



$C_{11}H_{17}N_2O_2SNa$ Mol wt 264.32

Thiopental Sodium contains not less than 89 per cent and not more than 92 per cent of thiopental ($C_{11}H_{18}N_2O_2S$), calculated on a moisture-free basis, corresponding to not less than 97 per cent of $C_{11}H_{17}N_2O_2SNa$.

Description—Thiopental Sodium occurs as a yellowish white, hygroscopic powder and has a disagreeable odor. Its solution is alkaline to litmus paper.

Solubility—Thiopental Sodium is soluble in water and in alcohol. It is insoluble in absolute ether, in benzene, and in petroleum benzin. Its solution decomposes on standing; on boiling precipitation occurs.

Identification—

A: Dissolve about 500 mg. of Thiopental Sodium in 10 cc. of water and add an excess of diluted hydrochloric acid: a white precipitate of thiopental is produced.

B: Ignite about 500 mg. of Thiopental Sodium: the residue responds to the test for *Sodium*, page 663, and, faintly, for *Sulfide*, page 663.

C: Dissolve about 100 mg. of Thiopental Sodium in 10 cc. of water and add 1 cc. of mercury bichloride T.S.: a white precipitate results which is soluble in an excess of ammonia T.S.

D: The residue of thiopental obtained in the *Assay* melts between 156° and 159°, page 667.

Loss on drying—When dried at 70° for 24 hours, Thiopental Sodium loses not more than 2 per cent of its weight.

Heavy metals—Dissolve 1 Gm. of Thiopental Sodium in 45.5 cc. of water Add slowly, with stirring, 4.5 cc. of normal hydrochloric acid, allow to stand for several

minutes, and filter. The heavy metals limit, page 657, of Thiopental Sodium, determined on 25 cc. of the filtrate, is 20 parts per million.

Free thiopental—Place about 1 Gm. of Thiopental Sodium, accurately weighed, in a glass-stoppered cylinder, add 50 cc. of absolute ether, stopper, and shake the mixture for 10 minutes. Decant the supernatant liquid through filter paper into a tared beaker, and repeat the operation twice, using 25 cc. and 15 cc. of absolute ether, respectively, and the same filter. Evaporate the combined filtrates to dryness, and dry the residue at 80° for 1 hour: the weight of the residue does not exceed 0.5 per cent of the weight of the Thiopental Sodium taken.

Assay—Dissolve about 500 mg. of Thiopental Sodium, accurately weighed, in 50 cc. of water in a separator. Add 10 cc. of diluted hydrochloric acid, and completely extract the liberated thiopental with successive portions of chloroform, evaporate the combined chloroform extracts to dryness in a stream of warm air, and dry to constant weight at 70°.

Packaging and storage—Preserve Thiopental Sodium in tight containers.

Thiopental Sodium, Sterile

STERILE THIOPENTAL SODIUM

Thiopentalum Sodicum Sterile

Thiopental. Sod. Steril.—Sterile Thiopentone Soluble

Sterile Thiopental Sodium is a mixture of thiopental sodium with anhydrous sodium carbonate as a buffer. It contains not less than 84 per cent and not more than 87 per cent of thiopental ($C_{11}H_{18}N_2O_2S$), calculated on a moisture-free basis, corresponding to not less than 91.7 per cent of $C_{11}H_{17}N_2O_2SNa$. It meets the requirements of the *Sterility Test for Solids*, page 689.

Sterile Thiopental Sodium conforms to the *Description*, and *Identification Tests A*, *B*, and *D*, and meets the requirements under *Loss on drying*, *Heavy metals*, and *Free thiopental* under *Thiopental Sodium*, page 572.

Completeness of solution—Place 2 Gm. of Sterile Thiopental Sodium in a glass-stoppered, 25-cc. cylinder, nearly fill the cylinder with carbon dioxide-free water, stopper the cylinder, and shake gently until the Sterile Thiopental Sodium is dissolved: the solution is clear.

Assay—Proceed as directed for the *Assay* under *Thiopental Sodium*, page 572.

Packaging and storage—Preserve Sterile Thiopental Sodium in tight containers so closed that the sterility of the product is maintained until the package is opened for use. Each package contains not more than 10 Gm. of Sterile Thiopental Sodium. The container may be of such size as to permit solution within the container.

Labeling—The quantity of Sterile Thiopental Sodium and the lot number must be stated on the label of each package.

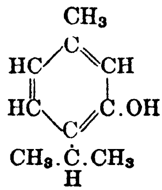
Sizes—Packages of Sterile Thiopental Sodium usually available contain the following amounts of Sterile Thiopental Sodium: 0.5 Gm. (7½ grains), 1.0 Gm. (15 grains), and 5.0 Gm. (75 grains).

AVERAGE DOSE—For anesthesia—To be determined by the physician according to the needs of the patient.

Thymol

THYMOL

Thymol



$C_{10}H_{14}O$ Mol. wt. 150.21

Description—Thymol occurs as colorless crystals, often large, or as a white, crystalline powder. It has an aromatic, thyme-like odor and a pungent taste. It is affected by light. Thymol is heavier than water, but when liquefied by fusion it is lighter than water. Its alcohol solution is neutral to litmus paper.

Solubility—One Gm. of Thymol dissolves in about 1000 cc. of water, in 1 cc. of alcohol, in 1 cc. of chloroform, in 1.5 cc. of ether, and in about 2 cc. of olive oil. It is soluble in glacial acetic acid and in fixed or volatile oils.

Melting range—Thymol melts between 48° and 51°, but when melted remains liquid at a considerably lower temperature, page 667.

Identification—

A: When Thymol is triturated with about an equal weight of camphor or menthol, the mixture liquefies.

B: Dissolve a very small crystal of Thymol in 1 cc. of glacial acetic acid, and add 6 drops of sulfuric acid and 1 drop of nitric acid: the liquid shows a deep bluish green color when viewed by reflected light.

C: Heat about 1 Gm. of Thymol in a test tube in a water bath with 5 cc. of a 10 per cent solution of sodium hydroxide: a clear, colorless, or pale red solution is formed, which becomes darker on standing, without the separation of oily drops. Upon the addition of a few drops of chloroform to this solution and agitating the mixture, a violet color is produced.

Non-volatile matter—Volatilize about 2 Gm. of Thymol on a water bath, and dry at 100° to constant weight: not more than 0.05 per cent of residue remains.

Packaging and storage—Preserve Thymol in tight, light-resistant containers.

AVERAGE DOSE—Anthelmintic, divided into three doses, 2 Gm. (approximately 30 grains).

THYROID

Thyroideum

Thyroid.

Thyroid is the cleaned, dried, and powdered thyroid gland previously deprived of connective tissue and fat. It is obtained from domesticated animals that are used for food by man.

Thyroid contains not less than 0.17 per cent and not more than 0.23 per cent of iodine in thyroid combination, and must be free from iodine in inorganic or any form of combination other than that peculiar to the thyroid gland. A desiccated thyroid of a higher iodine content may be brought to this standard by admixture with a desiccated thyroid of a lower iodine content or with lactose, sodium chloride, starch, or sucrose.

Description—Thyroid is a yellowish to buff colored, amorphous powder, having a slight, characteristic, meat-like odor and a saline taste.

Identification—When suitably mounted and examined under the microscope, Thyroid shows numerous smooth to striated hyaline fragments of colloid, of angular to irregular shape which are colorless to pale yellow in water mounts, brown in Mallory's stain and pink in eosin solution, some of these fragments containing granules, minute vacuoles, crystalloidal bodies and cells; numerous irregular fragments of follicular epithelium staining brown with Mallory's stain, the individual cells more or less polygonal to rounded-angular or irregularly cuboidal, often with prominent nuclei staining dark blue, their cytoplasm purplish with Delafield's hematoxylin T.S.; slender, glistening segments of capillaries of closely undulate outline; numerous slender segments of neuraxons; numerous aggregates of particles of intercellular substance and slender, mostly straight, connective tissue fibers staining blue to greenish blue with a mixture of Mallory's stain and phosphotungstic acid T.S., the bundles of fibers often appearing reddish in Mallory's stain; few glistening fragments of blood vessels with serrated or crenated ends as viewed in water mounts.

Moisture—Thyroid contains not more than 6 per cent of moisture as determined by the *Moisture method by toluene distillation*, page 712.

Inorganic iodides—Place 1 Gm. of Thyroid in a dry test tube and add 10 cc. of a saturated solution of zinc sulfate. Shake for about 5 minutes and filter through a fritted glass filter. To 5 cc. of the filtrate add 0.5 cc. of starch T.S., 4 drops of solution of sodium nitrite (1 in 10), and 4 drops of diluted sulfuric acid, shaking after each addition. No blue color is produced.

Assay—Weigh accurately about 1 Gm. of Thyroid in a porcelain crucible, add 7 Gm. of anhydrous potassium carbonate, mix thoroughly, and gently tap the crucible on the desk several times to compact the mixture. Overlay with an additional 10 Gm. of potassium carbonate, and compact the material thoroughly by tapping. Ignite the mixture for 25 minutes at 675° to 700° in a muffle furnace preheated to that temperature. Cool, add 20 cc. of water, or more if necessary, heat gently to boiling, and decant through a filter into an Erlenmeyer flask of suitable size. Repeat the extraction by boiling with 20 cc. of water, then wash the crucible and the char on the filter with hot water until the filtrate measures approximately 200 cc. Add 7 cc. of freshly prepared bromine T.S., then slowly add 40 cc. of dilute phosphoric acid (1 in 2), and boil until starch iodide paper is no longer colored blue by the vapors. During the boiling add water from time to time, as necessary, to maintain a volume of at least 200 cc. Wash down the walls of the flask with water and continue the boiling for 5 minutes. Cool, add 5 cc. of a solution of phenol (1 in

20), again rinse the walls of the flask and allow to stand for 5 minutes. Add 2 cc. of dilute phosphoric acid (1 in 2) and 5 cc. of potassium iodide T.S., and titrate immediately with hundredth-normal sodium thiosulfate, adding 3 cc. of starch T.S. as indicator when the end-point is neared. Perform a blank test with the same quantities of the same reagents and in the same manner, and make any necessary correction. Each cc. of hundredth-normal sodium thiosulfate is equivalent to 0.2115 mg. of iodine (I).

Storage—Preserve Thyroid in tight containers.

AVERAGE DOSE—**60 mg.** (approximately 1 grain).

Thyroid Tablets

THYROID TABLETS

Tabellæ Thyroidei

Tab. Thyroid.

Thyroid Tablets contain an amount of iodine (I) equivalent to not less than 0.17 per cent and not more than 0.23 per cent of the labeled amount of thyroid.

Inorganic iodides—Place a quantity of finely powdered Thyroid Tablets, equivalent to about 1 Gm. of thyroid, in a dry test tube and add 10 cc. of a saturated solution of zinc sulfate. Shake for about 5 minutes and filter through a fritted glass filter. To 5 cc. of the filtrate add 0.5 cc. of starch T.S., 4 drops of sodium nitrite solution (1 in 10), and 4 drops of diluted sulfuric acid, shaking after each addition: no blue color is produced.

Assay—Weigh a counted number of not less than 20 Thyroid Tablets, and reduce them to a fine powder without appreciable loss. Weigh accurately a portion of the powdered tablets, equivalent to about 1 Gm. of thyroid, place it in a large porcelain crucible and proceed as directed in the *Assay* for *Thyroid*, page 575, beginning with the words "add 7 Gm. of anhydrous potassium carbonate." Each cc. of hundreth-normal sodium thiosulfate is equivalent to 0.2116 mg. of iodine (I).

Storage—Preserve Thyroid Tablets in tight containers.

Sizes—Thyroid Tablets usually available contain the following amounts of thyroid: 15, 30, 60, and 120 mg. (¼, ½, 1, and 2 grains).

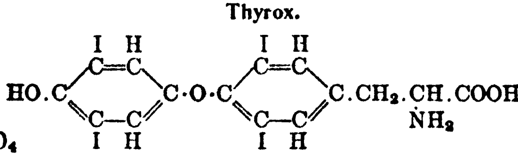
AVERAGE DOSE OF THYROID—**60 mg.** (approximately 1 grain).

Thyroxin

THYROXIN

Thyroxinum

Thyrox.



$C_{15}H_{11}I_4NO_4$ **Mol. wt. 776.93**

Thyroxin is an active physiological principle obtained from the thyroid gland or prepared synthetically, and contains, when dried over sulfuric

acid for 18 hours, not less than 64 per cent of iodine as an integral part of the Thyroxin molecule.

Description—Thyroxin occurs as white, needle-like, odorless and tasteless crystals. It is affected by light.

Solubility—Thyroxin is insoluble in water, in alcohol, and in the other usual organic solvents, but in the presence of mineral acids or alkalies it dissolves in alcohol. It is soluble in solutions of the alkali hydroxides and in hot solutions of the alkali carbonates. When alkali hydroxide solutions of Thyroxin are saturated with sodium chloride, the sodium salt of Thyroxin separates.

Identification—

A: Ignite 5 mg. of Thyroxin with 100 mg. of sodium carbonate and dissolve the residue in 2 cc. of water: the solution responds to the tests for *Iodide*, page 661.

B: Dissolve 5 mg. of Thyroxin in 5 cc. of alcohol containing 4 drops of hydrochloric acid, and add 5 or 6 drops of sodium nitrite solution (1 in 100): the solution develops a yellow color which increases when heated. On cooling the solution and adding stronger ammonia T.S. until distinctly alkaline, a pink color is produced.

Loss on drying—Dry about 20 mg. of Thyroxin, accurately weighed, over sulfuric acid for 18 hours: the loss in weight is negligible.

Residue on ignition—The residue on ignition of 10 mg. of Thyroxin is negligible, page 685.

Soluble halides—Shake 10 mg. of Thyroxin with 10 cc. of water during 5 minutes, and filter. Acidify the filtrate with 1 drop of diluted nitric acid, and add 3 drops of tenth-normal silver nitrate: the turbidity so produced is not greater than that produced in a control test by 0.1 cc. of fiftieth-normal hydrochloric acid.

Assay—Mix about 20 mg. of Thyroxin, previously dried over sulfuric acid for 18 hours and accurately weighed, with about 500 mg. of anhydrous potassium carbonate in a small nickel crucible. Cover the mixture with an additional 1 Gm. of anhydrous potassium carbonate, and heat gradually until it is completely decomposed. Treat with water, and transfer it completely to a 100-cc. graduated flask. Heat the solution on a water bath, and add a solution of potassium permanganate (1 in 20), drop by drop, until the liquid remains pink. Then add, drop by drop, just sufficient alcohol to discharge the pink color, cool to 25°, and dilute to 100 cc. with recently boiled and cooled water. Mix well, and filter through a dry filter into a dry flask, rejecting the first 20 cc. of the filtrate. To 50 cc. of the subsequent filtrate add about 500 mg. of potassium iodide and 30 cc. of diluted sulfuric acid, and titrate the liberated iodine with hundredth-normal sodium thiosulfate, using starch T.S. as the indicator toward the end. Perform a blank test with the same reagents and in the same manner and make any necessary corrections. Each cc. of hundredth-normal sodium thiosulfate is equivalent to 0.2116 mg. of Iodine (I).

Packaging and storage—Preserve Thyroxin in tight, light-resistant containers.

AVERAGE DOSE—**0.5 mg.** (approximately $\frac{1}{120}$ grain).

Tinctures, continued

Tolu Balsam

TOLU BALSAM

Balsamum Tolutanum

Balsam. Tolu.—Tolu

Tolu Balsam is obtained from *Myroxylon Balsamum* (Linné) Harms (Fam. *Leguminosæ*).

Description—Tolu Balsam is a brown or yellowish brown, plastic solid; transparent in thin layers and brittle when old, dried, or exposed to cold temperatures. It has a pleasant, aromatic odor resembling that of vanilla, and a mild, aromatic taste.

Solubility—Tolu Balsam is nearly insoluble in water and in petroleum benzin. It is soluble in alcohol, in chloroform, and in ether. It dissolves in solutions of sodium and potassium hydroxides, usually leaving an insoluble residue.

Reaction—An alcoholic solution of Tolu Balsam (1 in 20) is acid to litmus paper.

Rosin, rosin oil, or copaiba—Tolu Balsam does not show the presence of rosin, page 688.

Acid value—Dissolve about 1 Gm. of Tolu Balsam, accurately weighed, in 50 cc. of neutralized alcohol, add 1 cc. of phenolphthalein T.S., and titrate the solution with half-normal alcoholic potassium hydroxide: the acid value is not less than 112 and not more than 168, page 646.

Saponification value—Add sufficient half-normal alcoholic potassium hydroxide to the neutralized liquid obtained in the preceding test to make the total volume of the alkali solution added exactly 20 cc., heat the liquid on a water bath for 30 minutes under a reflux condenser, and cool. Mix this liquid with 200 cc. of water, or more if necessary, and titrate the excess of potassium hydroxide with half-normal hydrochloric acid. Determine the normality of the alcoholic potassium hydroxide in the same manner as in the test. The total volume of half-normal alcoholic potassium hydroxide consumed is equivalent to a saponification value of not less than 154 and not more than 220, page 647.

Packaging and storage—Preserve Tolu Balsam in tight containers and avoid exposure to excessive heat.

Tolu Balsam Syrup

TOLU BALSAM SYRUP

Syrupus Balsami Tolutani

Syr. Balsam. Tolu.—Syrup of Tolu

Tolu Balsam Tincture	50 cc.
Magnesium Carbonate	10 Gm.
Sucrose	820 Gm.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Mix the tincture intimately with the magnesium carbonate and 60 Gm. of sucrose in a mortar. Gradually add 430 cc. of distilled water with trituration, and filter. Dissolve the remainder of the sucrose in the clear filtrate with gentle heating, strain the syrup while warm, and add sufficient distilled water through the strainer to make the product measure 1000 cc. Mix thoroughly.

Tolu Balsam Syrup may also be made in the following manner:

Prepare a percolator as described under *Syrup*, page 548. Pour the filtrate, obtained as directed in the formula above, upon the remainder of the sucrose contained in the percolator, and when all of the liquid has run through, return portions of the percolate, if necessary, to dissolve all of the sucrose. Then pass enough distilled water through the cotton to make the product measure 1000 cc. Mix thoroughly.

Alcohol content—From 2 to 4 per cent, by volume, of C_2H_5OH.

Packaging and storage—Preserve Tolu Balsam Syrup in tight containers, preferably at a temperature not above 25°.

Tolu Balsam Tincture

TOLU BALSAM TINCTURE

Tinctura Balsami Tolutani

Tr. Balsam. Tolu.—Tolu Tincture

Tolu Balsam	200 Gm.
To make	1000 cc.

Prepare a tincture by Process M, page 708, using alcohol as the menstruum.

Packaging and storage—Preserve Tolu Balsam Tincture in tight, light-resistant containers, and avoid exposure to direct sunlight and to excessive heat.
Alcohol content—From 77 to 83 per cent, by volume, of C_2H_5OH.

Average dose—**2 cc.** (approximately 30 minims).

Totaquine

TOTAQUINE

Totaquina

Totaquin.

Totaquine is a mixture containing not less than 10 per cent of anhydrous quinine and not less than 70 per cent and not more than 80 per cent of total anhydrous crystallizable cinchona alkaloids, the remainder consisting substantially of diluents, preferably lactose, starch, or sucrose.

Description—Totaquine is a white to grayish white, or a slightly yellowish white powder. It is odorless, or nearly so, has a bitter taste, and is darkened by light.
Solubility—Totaquine is almost insoluble in water. Most of it dissolves in warm alcohol and in chloroform; it is also partly soluble in ether.
Identification—

A: Dissolve 100 mg. of Totaquine in 3 cc. of diluted sulfuric acid and dilute with water to 100 cc.: the solution has a distinct blue fluorescence when viewed in sunlight.

B: Add 2 drops of bromine T.S. to 5 cc. of the solution from the preceding test, then add 1 cc. of ammonia T.S.: the liquid acquires an emerald green color.

Loss on drying—Dry about 500 mg. of Totaquine, accurately weighed, at 100° for 4 hours: the loss on drying corresponds to not more than 5 per cent.
Residue on ignition—Gently ignite about 500 mg. of Totaquine, accurately weighed, until charred. Cool, add 1 cc. of sulfuric acid, and ignite to constant weight: the weight of the residue does not exceed 5 per cent.
Assay for quinine—Weigh accurately 4.0 Gm. of Totaquine and transfer it with the aid of about 50 cc. of water to a 100-cc. volumetric flask. Heat on a steam bath and add diluted hydrochloric acid, a few drops at a time, until no more Totaquine dissolves. Cool, dilute with water to 100-cc., and mix well. Filter the solution, if necessary, through a small dry filter into a dry flask, rejecting the first 10 cc. of the filtrate.

Transfer exactly 50 cc. of the solution to a tall, 200-cc. beaker, marked exactly at the 50-cc. level, heat to boiling, and add dilute ammonia T.S. (1 in 10) until the solution is neutral or faintly alkaline to litmus paper. Evaporate to about 45 cc., cool to 25°, and add water to make 50 cc. Add 40 cc. of alcohol, mix well, then add slowly, with stirring, 5 cc. of ammonia T.S., and allow to stand at 5° to 10° for 4 hours. Collect the precipitate of cinchonine on a tared Gooch filtering crucible, wash it with three 8-cc. portions of a mixture of 10 volumes of water and 8 volumes of alcohol (retain the filtrate and washings), dry at 100° for 4 hours and weigh.

If the cinchonine thus found is over 30.0 per cent, redissolve it in about 30 cc. of hot water with the aid of just sufficient hydrochloric acid, then proceed as described in the preceding paragraph, beginning with the words "heat to boiling, and add dilute ammonia T.S. (1 in 10)."

Neutralize the filtrate and washings from the precipitate of cinchonine with hydrochloric acid, using litmus paper, and evaporate to 50 cc. (If a second precipitation of cinchonine has been made, add the filtrate and washings from the second precipitation to that of the first during the evaporation.) If the solution is turbid, filter it, wash the filter with 15 cc. of hot water, and evaporate the filtrate and washings to 50 cc. Add to the hot liquid a solution of 4 Gm. of sodium tartrate in 10 cc. of hot water, and allow to stand over night at 25°. Filter through a tared filter, using the filtrate to transfer all of the precipitate to the filter. Wash the precipitate with four 5-cc. portions of cold water, dry it at 100° for 4 hours, and weigh. Add to the weight 35 mg. to compensate for the quantity held in solution. The corrected weight, multiplied by 0.79, represents the weight of cinchonidine and anhydrous quinine.

Dissolve 250 mg. of the dried precipitate in 2.0 cc. of normal hydrochloric acid and add sufficient water to make exactly 25 cc. Add to the solution 10 mg. of activated charcoal, slowly invert the solution five times, and filter at once through a small, dry filter into a dry flask, rejecting the first few cc. of the filtrate; then determine the rotation of the filtrate in a 100-mm. tube at 25°, in sodium light, and calculate the per cent of anhydrous quinine by the following formula:

$$\frac{(M - 80.5) \times 0.79 \times T}{0.505 \times S}$$

in which M is the observed angular rotation in minutes; T is the corrected weight in grams of the dried tartrate precipitate, and S is the weight of the Totaquine taken for the assay.

Assay for total anhydrous crystallizable cinchona alkaloids—Transfer exactly 25 cc. of the filtrate obtained as described in the first paragraph under *Assay for quinine* to a separator and dilute with 25 cc. of water. Render the solution distinctly alkaline with ammonia T.S. and at once extract the alkaloids completely with 25-cc. portions of chloroform. Filter the combined chloroform extracts through a small filter paper, moistened with chloroform, into a 250-cc. tared beaker. Rinse the vessel containing the chloroform extracts with two 10-cc. portions of chloroform, filtering these washings into the main extract. Evaporate the combined chloroform solutions on a steam bath to about 10 cc., add 10 cc. of alcohol, evaporate to dryness, and dry to constant weight at 100°. The weight so obtained represents the total alkaloids.

Warm the weighed residue in the beaker with 5 to 10 cc. of alcohol, add 40 cc. of tenth-normal sulfuric acid, and digest on a steam bath until the alkaloidal residue is dissolved. Cool, dilute with 40 cc. of water, add 0.2 cc. of methyl red T.S., and titrate the excess of acid with tenth-normal sodium hydroxide, stirring the solution vigorously during the titration. Each cc. of tenth-normal acid is equivalent to 29.44 mg. of crystallizable cinchona alkaloids. To the weight so calculated add 0.1 per cent for every 1 per cent of quinine found in the *Assay for quinine*. The percentage of total alkaloids found by the titration is not more than 1 per cent greater, and not more than 2 per cent less than the percentage found by weight.

Packaging and storage—Preserve Totaquine in well-closed, light-resistant containers.

Average dose—0.6 Gm. (approximately 10 grains).

Totaquine Capsules

TOTAQUINE CAPSULES

Capsulæ Totaquinæ

Cap. Totaquin.

Totaquine Capsules contain an amount of anhydrous quinine corresponding to not less than 9.5 per cent of the labeled amount of totaquine, and an amount of total anhydrous crystallizable cinchona alkaloids corresponding to not less than 66 per cent and not more than 84 per cent of the labeled amount of totaquine.

Identification—Dissolve the contents of a quantity of Totaquine Capsules equivalent to about 100 mg. of totaquine in 3 cc. of diluted sulfuric acid, and dilute with water to 100 cc.: the solution responds to the *Identification tests* under *Totaquine*, page 580.

Assay for quinine—Transfer as completely as possible the contents of a counted number of the Capsules, equivalent to about 4 Gm. of totaquine, to a flask. Place the emptied Capsules in a beaker, cover them with alcohol, warm for 15 minutes with frequent agitation, filter into the flask containing the totaquine, and wash the Capsules and the beaker with warm alcohol. Heat the flask with its contents at 65° to 70°, adding more alcohol, if necessary, until no more dissolves. Filter the solution while warm into a beaker, and wash the flask and the filter well with small portions of hot alcohol until 1 cc. of the washings, when evaporated with a drop of diluted hydrochloric acid, yields no turbidity with mercuric-potassium iodide T.S. Add to the alcohol solution 5 cc. of diluted hydrochloric acid and 75 cc. of water, and evaporate to about 75 cc. Cool, transfer the solution completely, with the aid of water, to a 100-cc. volumetric flask, add water to make 100 cc., and mix well. Then proceed as directed in the *Assay for quinine* under *Totaquine*, page 580, beginning with the words "Transfer exactly 50 cc. of the solution to a tall, 200-cc. beaker."

Assay for total anhydrous crystallizable cinchona alkaloids—Transfer exactly 25 cc. of the solution prepared in the *Assay for quinine* to a separator, dilute with 25 cc. of water, and proceed as described in the *Assay for total anhydrous crystallizable cinchona alkaloids* under *Totaquine*, page 580, beginning with the words "Render the solution distinctly alkaline with ammonia T.S."

Packaging and storage—Preserve Totaquine Capsules in well-closed, light-resistant containers.

Sizes—Totaquine Capsules usually available contain the following amounts of totaquine: 120, 200, and 300 mg. (2, 3, and 5 grains).

AVERAGE DOSE OF TOTAQUINE—**0.6 Gm.** (approximately 10 grains).

Totaquine Tablets

TOTAQUINE TABLETS

Tabellæ Totaquinæ

Tab. Totaquin.

Totaquine Tablets contain an amount of anhydrous quinine corresponding to not less than 9.5 per cent of the labeled amount of totaquine,

and an amount of total anhydrous crystallizable cinchona alkaloids corresponding to not less than 66 per cent and not more than 84 per cent of the labeled amount of totaquine.

Identification—Dissolve a quantity of the powdered Tablets, equivalent to about 100 mg. of totaquine, in 3 cc. of diluted sulfuric acid, and dilute with water to 100 cc.: the solution responds to the *Identification tests* under *Totaquine*, page 580.

Assay for quinine—Weigh a counted number of Totaquine Tablets, corresponding to about 4 Gm. of totaquine, and reduce them to a fine powder without appreciable loss. Transfer the powder completely to a flask with the aid of alcohol, then add sufficient alcohol to make about 175 cc. and heat at 65° to 70°, adding more alcohol if necessary, until no more powder dissolves. Filter while warm into a beaker and wash the flask and filter well with small quantities of hot alcohol until 1 cc. of the washings, when evaporated with a drop of diluted hydrochloric acid, yields no turbidity with mercuric-potassium iodide T.S. Add to the alcohol solution 5 cc. of diluted hydrochloric acid and 75 cc. of water and evaporate to about 75 cc. Cool, transfer the solution completely with the aid of water to 100-cc. volumetric flask, add water to make 100 cc., and mix well. Then proceed as directed in the *Assay for quinine* under *Totaquine*, page 580, beginning with the words "Transfer exactly 50 cc. of the solution to a tall, 200-cc. beaker."

Assay for total anhydrous crystallizable cinchona alkaloids—Transfer exactly 25 cc. of the solution prepared in the *Assay for quinine* to a separator, dilute with 25 cc. of water, and then proceed as directed in the *Assay for total anhydrous crystallizable cinchona alkaloids* under *Totaquine*, page 580, beginning with the words "Render the solution distinctly alkaline with ammonia T.S."

Packaging and storage—Preserve Totaquine Tablets in well-closed, light-resistant containers.

Sizes—Totaquine Tablets usually available contain the following amounts of totaquine: 120, 200 and 300 mg. (2, 3, and 5 grains).

Average dose of totaquine—**0.6 Gm.** (approximately 10 grains).

Toxoids

Tragacanth

TRAGACANTH

Tragacantha

Trag.—Gum Tragacanth

Tragacanth is the dried gummy exudation from *Astragalus gummifer* Labillardière, or other Asiatic species of *Astragalus* (Fam. *Leguminosæ*)

Description—

Unground Tragacanth—In flattened, lamellated, frequently curved fragments or in straight or spirally twisted linear pieces from 0.5 to 2.5 mm. in thickness; white to weak yellow, translucent and horny; fracture short; rendered more easily pulverizable by heating to 50°; inodorous; taste insipid, mucilaginous.

Histology—Pieces of Tragacanth softened in water and mounted in water or glycerin show numerous lamellæ and a few starch grains.

Powdered Tragacanth—White to yellowish white; angular fragments of mucilage with circular or irregular lamellæ; starch grains from 3 to 25 microns in diameter, mostly simple, spherical to elliptical, with occasional 2- to 4-compound grains, a few of the grains being swollen and more or less altered. The powder shows few or no fragments of lignified vegetable tissue (*Indian gum*).

Identification—Add 1 Gm. of Tragacanth to 50 cc. of water: it swells and forms a smooth, nearly uniform, stiff, opalescent mucilage free from cellular fragments.

Karaya gum—Boil 1 Gm. of Tragacanth with 20 cc. of water until a mucilage is formed, then add 5 cc. of hydrochloric acid, and again boil the mixture for 5 minutes: no pink or red color is developed.

Tragacanth Mucilage

TRAGACANTH MUCILAGE

Mucilago Tragacanthæ

Mucil. Trag.

TRAGACANTH	6 Gm.
BENZOIC ACID	0.2 Gm.
GLYCERIN	18 Gm.
DISTILLED WATER, a sufficient quantity,	
To make	100 Gm.

Mix the glycerin with 75 cc. of distilled water in a tared vessel, heat the mixture to boiling, discontinue the application of heat, add the tragacanth and the benzoic acid, and macerate the mixture during 24 hours, stirring occasionally. Then add enough distilled water to make the

mixture weigh 100 Gm., stir actively until of uniform consistence, and strain forcibly through muslin.

Packaging and storage—Preserve Tragacanth Mucilage in tight containers.

Triasyn B Capsules

TRIASYN B CAPSULES

Capsulæ Triasyni B

Cap. Triasyn. B

Triasyn B Capsules contain, in each capsule, not less than 2 mg. of thiamine hydrochloride, 3 mg. of riboflavin, and 20 mg of nicotinamide.

Assays for thiamine hydrochloride, riboflavin, and nicotinamide—Proceed as directed in the assays for these vitamins under *Hexavitamin Capsules*, page 250.
Packaging and storage—Preserve Triasyn B Capsules in tight, light-resistant containers.
Labeling—The labeling shall include no claim based upon any quantity of vitamin in excess of that specified in this monograph.

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

Triasyn B Tablets

TRIASYN B TABLETS

Tabellæ Triasyni B

Tab. Triasyn. B

Triasyn B Tablets contain, in each tablet, not less than 2 mg. of thiamine hydrochloride, 3 mg. of riboflavin, and 20 mg. of nicotinamide.

Assays for thiamine hydrochloride, riboflavin, and nicotinamide—Proceed as directed in the assays for these vitamins under *Hexavitamin Tablets*, page 251.
Packaging and storage—Preserve Triasyn B Tablets in tight, light-resistant containers.
Labeling—The labeling shall include no claim based upon any quantity of vitamin in excess of that specified in this monograph.

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

Tragacanth

TRAGACANTH

Tragacantha

Trag.—Gum Tragacanth

Tragacanth is the dried gummy exudation from *Astragalus gummifer* Labillardière, or other Asiatic species of *Astragalus* (Fam. *Leguminosæ*)

Description—

Unground Tragacanth—In flattened, lamellated, frequently curved fragments or in straight or spirally twisted linear pieces from 0.5 to 2.5 mm. in thickness; white to weak yellow, translucent and horny; fracture short; rendered more easily pulverizable by heating to 50°; inodorous; taste insipid, mucilaginous.

Histology—Pieces of Tragacanth softened in water and mounted in water or glycerin show numerous lamellæ and a few starch grains.

Powdered Tragacanth—White to yellowish white; angular fragments of mucilage with circular or irregular lamellæ; starch grains from 3 to 25 microns in diameter, mostly simple, spherical to elliptical, with occasional 2- to 4-compound grains, a few of the grains being swollen and more or less altered. The powder shows few or no fragments of lignified vegetable tissue (*Indian gum*).

Identification—Add 1 Gm. of Tragacanth to 50 cc. of water: it swells and forms a smooth, nearly uniform, stiff, opalescent mucilage free from cellular fragments.

Karaya gum—Boil 1 Gm. of Tragacanth with 20 cc. of water until a mucilage is formed, then add 5 cc. of hydrochloric acid, and again boil the mixture for 5 minutes: no pink or red color is developed.

Tragacanth Mucilage

TRAGACANTH MUCILAGE

Mucilago Tragacanthæ

Mucil. Trag.

TRAGACANTH	6	Gm.
BENZOIC ACID	0.2	Gm.
GLYCERIN	18	Gm.
DISTILLED WATER, a sufficient quantity,		
To make	100	Gm.

Mix the glycerin with 75 cc. of distilled water in a tared vessel, heat the mixture to boiling, discontinue the application of heat, add the tragacanth and the benzoic acid, and macerate the mixture during 24 hours, stirring occasionally. Then add enough distilled water to make the

mixture weigh 100 Gm., stir actively until of uniform consistence, and strain forcibly through muslin.

Packaging and storage—Preserve Tragacanth Mucilage in tight containers.

Triasyn B Capsules

TRIASYN B CAPSULES

Capsulæ Triasyni B

Cap. Triasyn. B

Triasyn B Capsules contain, in each capsule, not less than 2 mg. of thiamine hydrochloride, 3 mg. of riboflavin, and 20 mg of nicotinamide.

Assays for thiamine hydrochloride, riboflavin, and nicotinamide—Proceed as directed in the assays for these vitamins under *Hexavitamin Capsules*, page 250.

Packaging and storage—Preserve Triasyn B Capsules in tight, light-resistant containers.

Labeling—The labeling shall include no claim based upon any quantity of vitamin in excess of that specified in this monograph.

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

Triasyn B Tablets

TRIASYN B TABLETS

Tabellæ Triasyni B

Tab. Triasyn. B

Triasyn B Tablets contain, in each tablet, not less than 2 mg. of thiamine hydrochloride, 3 mg. of riboflavin, and 20 mg. of nicotinamide.

Assays for thiamine hydrochloride, riboflavin, and nicotinamide—Proceed as directed in the assays for these vitamins under *Hexavitamin Tablets*, page 251.

Packaging and storage—Preserve Triasyn B Tablets in tight, light-resistant containers.

Labeling—The labeling shall include no claim based upon any quantity of vitamin in excess of that specified in this monograph.

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

Tribromoethanol

TRIBROMOETHANOL

Tribromoæthanol

Tribromoæth.—Tribromoethyl Alcohol

$Br_3C.CH_2OH$

$C_2H_3Br_3O$ Mol. wt. 282.79

Tribromoethanol, when dried over sulfuric acid for 4 hours, contains not less than 99 per cent of $C_2H_3Br_3O$.

Description—Tribromoethanol occurs as a white, crystalline powder, with a slight, aromatic odor and taste. It is unstable in air and in light. Both water and alcohol solutions of Tribromoethanol decompose on exposure to light.

Solubility—One Gm. of Tribromoethanol dissolves in about 35 cc. of water. It is very soluble in amylene hydrate.

Melting range—Tribromoethanol melts between 79° and 82°, page 667.

Identification—Dissolve about 200 mg. of Tribromoethanol in 10 cc. of water, add 1 cc. of sodium hydroxide T.S., and heat the solution at about 100° for 30 minutes. Render the solution slightly acid with nitric acid, and add a few drops of silver nitrate T.S.: a yellowish, curdy precipitate is formed which is insoluble in nitric acid but soluble in an excess of stronger ammonia T.S.

Acid—A solution of Tribromoethanol (1 in 50), prepared at 35° to 40° and tested immediately, is not acid to methyl red T.S.

Loss on drying—When dried over sulfuric acid for 4 hours, Tribromoethanol loses not more than 1 per cent of its weight.

Residue on ignition—Tribromoethanol yields not more than 0.1 per cent of residue on ignition, page 685.

Halogen ions—Dissolve 200 mg. of Tribromoethanol in 10 cc. of water at about 40°, quickly cool to 25°, and add 5 drops of diluted nitric acid and 0.5 cc. of silver nitrate T.S.: no opalescence is produced immediately.

Readily carbonizable substances—Dissolve 100 mg. of Tribromoethanol in 1 cc. of sulfuric acid: the solution has no more color than matching fluid A, page 680.

Aldehyde—Dissolve 100 mg. of Tribromoethanol in 5 cc. of water at 35° to 40°, quickly cool to 25°, and add 1 cc. of phenylhydrazine acetate T.S.: no precipitate forms within 30 minutes.

Assay—Dissolve about 300 mg. of Tribromoethanol, previously dried over sulfuric acid for 4 hours and accurately weighed, in 20 cc. of sodium hydroxide T.S., and boil gently under a reflux condenser for 1 hour. Rinse the condenser with 20 cc. of water, cool to room temperature, add 20 cc. of diluted nitric acid, 50 cc. of tenth-normal silver nitrate, and 5 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Perform a blank test with the same quantities of reagents and in the same manner, and make any necessary correction. Each cc. of tenth-normal silver nitrate corresponds to 9.426 mg. of $C_2H_3Br_3O$. Each Gm. of Tribromoethanol consumes not less than 105.0 cc. and not more than 108.0 cc. of tenth-normal silver nitrate.

Packaging and storage—Preserve Tribromoethanol in tight, light-resistant containers.

AVERAGE DOSE—Rectal (for each kilogram of body weight), **60 mg.** (approximately 1 grain).

Caution—The total amount administered should not exceed 8 Gm. for women or 10 Gm. for men, regardless of body weight.

TRIBROMOETHANOL SOLUTION

Liquor Tribromoæthanolis

Liq. Tribromoæth.—Tribromoethyl Alcohol Solution, Bromethol

Tribromoethanol Solution is a solution of tribromoethanol in amylene hydrate containing, in each 100 cc., not less than 99 Gm. and not more than 101 Gm. of $C_2H_3Br_3O$.

TRIBROMOETHANOL..................................	100 Gm.
AMYLENE HYDRATE, a sufficient quantity	
To make..........................	100 cc.

Dissolve the tribromoethanol in 50 cc. of amylene hydrate, and add sufficient amylene hydrate to make 100 cc.

Note—For use as an anesthetic, dilute the Tribromoethanol Solution with warm distilled water in the proportion of 2.5 cc. of Solution to 100 cc. of the dilution. Mix 5 cc. of this dilution with 1 drop of Congo red T.S.: it has the same color as a mixture of 5 cc. of distilled water and 1 drop of Congo red T.S.

Description—Tribromoethanol Solution is a clear, colorless liquid, having a camphor-like odor and a burning taste.

Acid—Add 1.0 cc. of Tribromoethanol Solution to 40 cc. of water at a temperature of 40° in a glass-stoppered flask. Shake the mixture vigorously until all globules have disappeared. Immediately place 5 cc. of the resulting solution in a clean glass test tube and add 1 drop of a solution of Congo red (1 in 1000). The color produced is the same as that produced by the addition of 1 drop of the Congo red solution to 5 cc. of water in a similar test tube.

Assay—Place 2 cc. of Tribromoethanol Solution, accurately measured with a transfer pipette, in a flask, add 50 cc. of sodium hydroxide T.S., and heat on a water bath under a reflux condenser for 1 hour. Rinse the condenser with 20 cc. of water and add 50 cc. of diluted nitric acid. Cool the solution to 25°, transfer it to a 200-cc. volumetric flask, and rinse the first flask with three 10-cc. portions of water, adding the rinsings to the solution, and finally add sufficient water to make the solution, after thorough mixing, measure exactly 200 cc. at 25°. To 25 cc. of the resulting solution, accurately measured, add 50 cc. of tenth-normal silver nitrate, 5 cc. of nitric acid, and 5 cc. of ferric ammonium sulfate T.S., and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate. Perform a blank determination with the same reagents and in the same manner and make any necessary correction. Each cc. of tenth-normal silver nitrate corresponds to 9.426 mg. of $C_2H_3Br_3O$.

Packaging and storage—Preserve Tribromoethanol Solution in tight, light-resistant containers, carefully dried prior to filling.

AVERAGE DOSE—For each kilogram of body weight, rectal, **0.06 cc.** (approximately 1 minim).

Caution—The total amount administered should not exceed 8 cc. for women or 10 cc. for men, regardless of body weight.

Trichloroacetic Acid

TRICHLOROACETIC ACID

Acidum Trichloroaceticum

Acid. Trichloroacet.

$C_2HCl_3O_2$ — $Cl_3C.COOH$ — Mol. wt. 163.40

Trichloroacetic Acid, when dried over sulfuric acid for 18 hours, contains not less than 99 per cent of $C_2HCl_3O_2$.

Description—Trichloroacetic Acid occurs as colorless, deliquescent crystals, having a slight, characteristic odor. *It is highly corrosive to the skin.*
Solubility—One Gm. of Trichloroacetic Acid dissolves in about 0.1 cc. of water. It is soluble in alcohol and in ether.
Identification—Trichloroacetic Acid, heated with a solution of an alkali hydroxide, is decomposed, with the formation of an alkali carbonate and chloroform. The addition of a few drops of a saturated solution of aniline to the heated mixture produces the disagreeable odor of phenyl isocyanide. (*Caution: poisonous*)
Residue on ignition—Trichloroacetic Acid yields not more than 0.05 per cent of residue on ignition, page 685.
Chloride—A 1-Gm. portion of Trichloroacetic Acid shows no more *Chloride* than corresponds to 0.5 cc. of fiftieth-normal hydrochloric acid, page 709.
Sulfate—A 500-mg. portion of Trichloroacetic Acid shows no more *Sulfate* than corresponds to 0.4 cc. of fiftieth-normal sulfuric acid, page 709.
Assay—Place about 4 Gm. of Trichloroacetic Acid, previously dried over sulfuric acid for 18 hours, in a tared, glass-stoppered Erlenmeyer flask, and weigh accurately. Dissolve the Acid in about 40 cc. of water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 163.4 mg. of $C_2HCl_3O_2$.

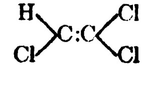
Each Gm. of Trichloroacetic Acid, previously dried over sulfuric acid for 18 hours, consumes not less than 6.06 cc. and not more than 6.12 cc. of normal sodium hydroxide.
Packaging and storage—Preserve Trichloroacetic Acid in tight containers, at a temperature not above 30°.

Trichloroethylene

TRICHLOROETHYLENE

Trichloroæthylenum

Trichloroæthylen.



C_2HCl_3 — Mol. wt. 131.40

Trichloroethylene contains not less than 99 per cent and not more than 99.5 per cent of C_2HCl_3, the remainder consisting of alcohol.

NOTE—Ammonium carbonate may be added as a preservative, not in excess of 20 mg. per 100 cc.

Description—Trichloroethylene is a clear, colorless, mobile liquid. It has a characteristic odor resembling that of chloroform. It is slowly decomposed by light in the presence of moisture. It is not inflammable.

Solubility—Trichloroethylene is practically insoluble in water. It is miscible with ether, alcohol, and chloroform, and dissolves most fixed and volatile oils.

Specific gravity—The specific gravity of Trichloroethylene is between 1.456 and 1.462, indicating not less than 99 per cent and not more than 99.5 per cent of C_2HCl_3.

Boiling range—Trichloroethylene boils between 86° and 88°, page 624.

Distinction from chloroform and carbon tetrachloride—Transfer 5 cc. of Trichloroethylene to a glass-stoppered cylinder, add 5 cc. of bromine T.S., and shake the mixture vigorously at intervals of 15 minutes: at the end of 1 hour a white, turbid solution forms in the lower layer. Chloroform and carbon tetrachloride remain clear.

Non-volatile residue—Evaporate 50 cc. of Trichloroethylene to dryness in a tared dish on a water bath, and dry the residue at 110° for 2 hours: the weight of the residue does not exceed 1 mg.

Acid—In each of two 50-cc. glass-stoppered cylinders of colorless glass, having an internal diameter of 20 mm., place 10 cc. of water, 2 drops of phenolphthalein T.S., and enough hundredth-normal sodium hydroxide to produce, after vigorous shaking, pink tints of equal intensity. Into one of the cylinders measure exactly 20 cc. of Trichloroethylene and again shake the mixture thoroughly. Add hundredth-normal sodium hydroxide, dropwise, shaking the mixture well after each addition, until the pink color is reproduced in an intensity equal to that in the cylinder without the Trichloroethylene: not more than 0.5 cc. of hundredth-normal sodium hydroxide is required to produce a pink color which persists for 15 minutes.

Chloride ion—Shake 25 cc. of Trichloroethylene with an equal volume of water for 5 minutes, and allow the liquids to separate completely. Draw off the water layer and to 10 cc. add 5 drops of silver nitrate T.S. and 1 drop of nitric acid: no turbidity results.

Acetylene—Agitate gently 5 cc. of Trichloroethylene with 2 cc. of silver ammonium nitrate T.S.: no turbidity is observed in either layer within 10 minutes.

Packaging and storage—Preserve Trichloroethylene in sealed, light-resistant ampuls or frangible, light-resistant glass tubes. Avoid proionged exposure to excessive heat. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Inhalation—1 cc. (approximately 15 minims).

Triethanolamine

TRIETHANOLAMINE

Triæthanolamina

Triæthanolam.

Triethanolamine is a mixture of alkanolamines consisting largely of triethanolamine $N(C_2H_4OH)_3$, admixed with various amounts of diethanolamine $NH(C_2H_4OH)_2$ and monoethanolamine $NH_2C_2H_4OH$.

It has an alkalinity equivalent to not less than 6.7 cc. and not more than 7.2 cc. of normal acid for each 1 Gm. of Triethanolamine.

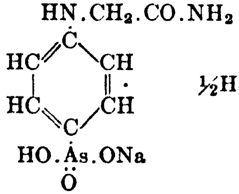
Description—Triethanolamine is a colorless to pale yellow, viscous, hygroscopic liquid having a slight ammoniacal odor.
Solubility—Triethanolamine is miscible with water and with alcohol. It is soluble in chloroform.
Specific gravity—The specific gravity of Triethanolamine is not less than 1.1204 and not more than 1.1284.
Refractive index—The refractive index of Triethanolamine is not less than 1.481 and not more than 1.486 at 20°, page 682.
Identification—
A: To 1 cc. of Triethanolamine add 0.1 cc. of copper sulfate T.S.: a deep blue color is produced. Add 5 cc. of sodium hydroxide T.S., and concentrate to one-third of the original volume by boiling: the blue color remains.
B: To 1 cc. of Triethanolamine add 0.3 cc. of cobaltous chloride T.S.: a carmine red color is produced.
C: Heat 1 cc. of Triethanolamine gently in a test tube: the vapors turn moistened red litmus paper blue.
Residue on ignition—The residue on ignition of 1 Gm. of Triethanolamine is negligible, page 685.
Assay—Transfer completely about 2 Gm. of Triethanolamine, accurately weighed, to a 300-cc. Erlenmeyer flask. Add 75 cc. of water and 2 drops of methyl red T.S., and titrate with normal hydrochloric acid: for each Gm. of Triethanolamine taken, not less than 6.7 cc. and not more than 7.2 cc. of normal hydrochloric acid is consumed.
Packaging and storage—Preserve Triethanolamine in tight, light-resistant containers.

Tryparsamide

TRYPARSAMIDE

Tryparsamidum

Tryparsam.



½H_2O

$C_8H_{10}AsN_2O_4Na.{}^1/_2H_2O$ Mol. wt. 305.09

Tryparsamide, dried to constant weight at 110°, contains not less than 25.1 per cent and not more than 25.5 per cent of arsenic (As).

Description—Tryparsamide occurs as a white, odorless, crystalline powder. It is slowly affected by light.

Solubility—One Gm. of Tryparsamide dissolves in about 2 cc. of water. It is slightly soluble in alcohol, but is insoluble in ether and in chloroform.

Identification—

A: To the solution remaining after the *Assay* add sulfuric acid, drop by drop, until the reaction is distinctly acid, then add sulfurous acid T.S. in excess, boil the mixture until the odor of sulfur dioxide disappears, and saturate the solution with hydrogen sulfide: a yellow precipitate is formed, soluble in ammonium carbonate T.S.

B: To 5 cc. of a solution of Tryparsamide (1 in 10) add 3 cc. of sodium hydroxide T.S. and boil the liquid: ammonia is evolved, recognizable by its odor.

C: To 1 cc. of a solution of Tryparsamide (1 in 10) add 1 cc. of calcium chloride T.S.: a precipitate of microscopic, wedge-shaped prisms is gradually formed.

Distinction from sodium cacodylate—To 1 cc. of a solution of Tryparsamide (1 in 10) add 1 cc. of diluted hydrochloric acid: a precipitate is formed.

Loss on drying—When dried to constant weight at 110°, Tryparsamide loses not less than 2.5 per cent and not more than 3.5 per cent of its weight.

Reaction—A solution of Tryparsamide (1 in 20) is neutral to litmus paper.

Arsenate—To 1 cc. of a solution of Tryparsamide (1 in 10) add 1 cc. of magnesia mixture T.S.: no precipitate forms in the cold solution, but on warming the solution a precipitate forms.

Arsanilic acid—To 5 cc. of a solution of Tryparsamide (1 in 10) add 0.3 cc. of a solution of sodium nitrite (1 in 10), and cool in ice water. Add 5 cc. of diluted hydrochloric acid and a solution of 500 mg. of betanaphthol in 10 cc. of a solution of sodium hydroxide (1 in 10): no red color is produced.

Arsphenamine compounds—To 1 cc. of a solution of Tryparsamide (1 in 10) add 0.2 cc. of ferric chloride T.S.: no blue color is produced but a brown precipitate is obtained which dissolves upon the further addition of ferric chloride T.S.

Assay—Transfer about 200 mg. of Tryparsamide, previously dried to constant weight at 110° and accurately weighed, to a 150-cc. Erlenmeyer flask. Add 5 cc. of sulfuric acid, and after the Tryparsamide is thoroughly wetted, add 1 cc. of fuming nitric acid, and heat the flask on a hot plate for 1 hour at about 250°. Remove the flask from the hot plate, cautiously add 0.5 cc. more of fuming nitric acid, heat again for 5 minutes, and allow to cool slightly. Add about 2 Gm. of powdered ammonium sulfate in divided portions, agitating the flask well until all evolved gas is expelled. Transfer the cool solution, with the aid of water, to a 500-cc. Erlenmeyer flask, and add enough water to measure about 100 cc. Add 1 Gm. of potassium iodide, boil the liquid gently until the volume is reduced to about 40 cc., cool, and, if necessary, cautiously add tenth-normal sodium thiosulfate until the iodine color is completely discharged. Dilute with about 150 cc. of cold water, add sodium hydroxide solution (1 in 5) until the reaction is faintly alkaline to litmus, then add diluted sulfuric acid until the reaction is slightly acid. Add 20 cc. of a cold, saturated solution of sodium bicarbonate, and titrate with tenth-normal iodine, adding 1 cc. of starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 3.746 mg. of arsenic (As).

Packaging and storage—Preserve Tryparsamide in tight containers, preferably at a temperature not above 20° and protected from light.

Labeling—The container label must bear the official title, the quantity in grams of the Tryparsamide in the container, the lot number of the product, the name and address of the manufacturer, and the expiration date for the product.

The expiration date (the date beyond which the contents cannot be expected beyond reasonable doubt to retain its quality) is not more than 5 years from the date of manufacture.

AVERAGE DOSE—*Caution.* Intravenous, 2 Gm. (approximately 30 grains).

Regulations—The outside label must bear the manufacturer's lot number of the Tuberculin, the name, address, and license number of the manufacturer, and the date beyond which the Tuberculin may not be expected to retain the potency prescribed by the National Institute of Health of the United States Public Health Service.

Preservation and storage—Preserve Purified Protein Derivative of Tuberculin at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Diagnostic, **0.000,02 mg.** or **0.005 mg.**

TYPHOID AND PARATYPHOID VACCINE

Vaccinum Typhosum et Paratyphosum

Vac. Typhos. et Paratyphos.

Typhoid and Paratyphoid Vaccine is a suspension in isotonic sodium chloride solution or other suitable diluent of killed typhoid bacilli (*Eberthella typhosa*) of a strain selected for high antigenic efficiency and killed paratyphoid "A" bacilli (*Salmonella paratyphi*) and killed paratyphoid "B" bacilli (*Salmonella schottmülleri*).

The Vaccine shall contain, in each cc. at least 1,000,000,000 typhoid organisms and at least 250,000,000 of each of the paratyphoid organisms. Typhoid and Paratyphoid Vaccine, complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Typhoid and Paratyphoid Vaccine is a more or less turbid, whitish fluid; nearly odorless or having a faint odor due to the presence of a preservative. It must be sterile and must not contain an excessive amount of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used), and shall be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Typhoid and Paratyphoid Vaccine*, must indicate the number of each of the organisms represented in 1 cc., the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Typhoid and Paratyphoid Vaccine at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, **0.5 cc.** and **1 cc.**, the latter dose to be repeated once.

Typhoid Vaccine

TYPHOID VACCINE

Vaccinum Typhosum

Vac. Typhos.

Typhoid Vaccine is a sterile suspension in isotonic sodium chloride solution or other suitable diluent of killed typhoid bacilli (*Eberthella typhosa*), of a strain selected for high antigenic efficiency. The Vaccine shall contain, in each cc., at least 1,000,000,000 typhoid organisms. Typhoid Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Typhoid Vaccine is a more or less turbid, whitish liquid, nearly odorless, or having a faint odor due to the presence of a preservative. It must not contain an excessive proportion of preservative (not more than 0.5 per cent of phenol or 0.4 per cent of cresol, if either of these is used). It shall be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear the name *Typhoid Vaccine*, and must indicate the number of organisms represented in 1 cc., the manufacturer's lot number of the Vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by governmental authority.

Packaging and storage—Preserve Typhoid Vaccine at a temperature between 2° and 10°, preferably at the lower limit. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Hypodermic, for active immunization, **0.5 cc.** and **1 cc.**, the latter dose to be repeated once.

Typhus Vaccine, Epidemic

EPIDEMIC TYPHUS VACCINE

Vaccinum Typhusum Epidemicum

Vac. Typhus. Epidem.—Typhus Vaccine

Epidemic Typhus Vaccine is a sterile suspension of the killed rickettsial organism of a strain or strains of epidemic typhus rickettsiæ selected for antigenic efficiency. The rickettsial organisms are obtained by culturing in the yolk sac membrane of the developing embryo of the domestic fowl (*Gallus domesticus*). Epidemic Typhus Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Epidemic Typhus Vaccine is a slightly turbid, colorless or reddish tinged liquid having a slight odor related to the method of purifying the rickettsial suspension. It must be free from harmful substances detectable by animal inoculation and must not contain phenol in excess of 0.25 per cent.

Regulations—The outside label must bear the statement: *Prepared from infected egg yolk sac membrane,* the manufacturer's lot number of the vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by the National Institute of Health of the United States Public Health Service.

Preservation and storage—Preserve Epidemic Typhus Vaccine at a temperature between 2° and 10°, preferably at the lower limit. It must be preserved in the unopened glass container in which it was placed by the manufacturer.

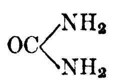
AVERAGE DOSE—Hypodermic, for active immunization, **1.0 cc.**, to be repeated once or twice with 7 to 10 day intervals. (A booster dose every six months is recommended when real danger of infection prevails.)

Urea

UREA

Urea

Carbamide



CH_4N_2O Mol. wt. 60.06

Description—Urea occurs as colorless to white, prismatic crystals, or as a white, crystalline powder. It is almost odorless, and has a cooling, saline taste. It may gradually develop a slight odor of ammonia. Its solutions are neutral to litmus paper.

Solubility—One Gm. of Urea dissolves in 1.5 cc. of water and in about 10 cc. of alcohol. One Gm. dissolves in about 1 cc. of boiling alcohol. It is almost insoluble in chloroform and in ether.

Melting range—Urea melts between 131° and 133°, page 667.

Identification—

A: Heat about 500 mg. of Urea in a test tube: it liquefies, and ammonia is evolved. Continue the heating until the liquid becomes turbid, then cool. Dissolve the fused mass in a mixture of 10 cc. of water and 1 cc. of a solution of sodium hydroxide (1 in 10), and add 1 drop of cupric sulfate T.S.: the solution acquires a reddish violet color.

B: Dissolve 100 mg. of Urea in 1 cc. of water, and add 1 cc. of nitric acid: a white, crystalline precipitate is produced.

Residue on ignition—Urea yields not more than 0.1 per cent of residue on ignition, page 685.

Chloride—A solution of 2 Gm. of Urea in water shows no more *Chloride* than corresponds to 0.2 cc. of fiftieth-normal hydrochloric acid, page 709.

Sulfate—A solution of 2 Gm. of Urea in water shows no more *Sulfate* than corresponds to 0.2 cc. of fiftieth-normal sulfuric acid, page 709.
Heavy metals—Dissolve 1 Gm. of Urea in 20 cc. of water, and add 5 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 657, for Urea is 20 parts per million.
Alcohol-insoluble matter—Dissolve 5 Gm. of Urea in 50 cc. of warm alcohol, and if any insoluble residue remains, filter the solution on a tared filter, wash the residue and filter with 20 cc. of warm alcohol, and dry at 110° to constant weight: the weight of the residue does not exceed 2 mg.
Packaging and storage—Preserve Urea in well-closed containers.

AVERAGE DOSE—8 Gm. (approximately 2 drachms).

Urethane

URETHANE
Urethanum

Ureth.—Ethyl Carbamate U. S. P. XII

$$\begin{array}{l} NH_2 \\ | \\ CO \\ | \\ O—C_2H_5 \end{array}$$

$C_3H_7O_2N$ Mol. wt. 89.09

Description—Urethane occurs as colorless, columnar crystals or as a white, granular powder. It is odorless, or nearly so, and has a cooling, saline taste. Its solutions are neutral to litmus paper.
Solubility—One Gm. of Urethane dissolves in 0.5 cc. of water, in 1 cc. of alcohol, in 3 cc. of glycerin, in about 1 cc. of chloroform, in about 2 cc. of ether, and in about 35 cc. of olive oil.
Melting range—Urethane melts between 48° and 50°, page 667.
Identification—
A: Add 1 Gm. of Urethane to 5 cc. of sulfuric acid and heat gently: decomposition follows with the evolution of carbon dioxide.
B: Heat 1 Gm. of Urethane with 5 cc. of sodium hydroxide T.S.: ammonia is given off, recognizable by its odor.
C: Dissolve about 500 mg. of Urethane in 5 cc. of water, add about 1 Gm. of monohydrated sodium carbonate and about 10 mg. of iodine, and warm the solution: yellow crystals of iodoform separate on cooling.
Completeness and color of solution—A solution of 1 Gm. of Urethane in 5 cc. of alcohol is practically complete and is colorless.
Loss on drying—When dried for 18 hours over sulfuric acid, Urethane loses not more than 2 per cent of its weight.
Residue on ignition—Urethane yields not more than 0.1 per cent of residue on ignition, page 685.
Chloride—A 500-mg. portion of Urethane shows no more *Chloride* than corresponds to 0.1 cc. of fiftieth-normal hydrochloric acid, page 709.

Nitrate—Mix 2 cc. of a solution of Urethane (1 in 20) with 1 cc. of ferrous sulfate T.S., and pour the mixture upon 2 cc. of sulfuric acid, so as to form separate layers: no red or brown zone appears.

Heavy metals—Dissolve 1 Gm. of Urethane in sufficient water to make 24 cc. and add 1 cc. of tenth-normal hydrochloric acid: the heavy metals limit, page 657, for Urethane is 10 parts per million.

Urea—Dissolve about 2 Gm. of Urethane in 2 cc. of water and add 5 cc. of nitric acid: no white precipitate is produced.

Packaging and storage—Preserve Urethane in well-closed containers, preferably at a temperature not above 30°.

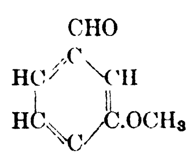
Vaccines

Vanillin

VANILLIN

Vanillinum

Vanillin.



$C_8H_8O_3$ Mol. wt. 152.14

Description—Vanillin occurs as fine, white to slightly yellow crystals, usually needle-like, having an odor and taste suggestive of vanilla. It is affected by light. Its solutions are acid to litmus paper.

Solubility—One Gm. of Vanillin dissolves in about 100 cc. of water and in about 20 cc. of glycerin. One Gm. dissolves in 20 cc. of water at 80°. It is freely soluble in alcohol, in chloroform, in ether, and in solutions of the fixed alkali hydroxides.

Melting range—Vanillin melts between 81° and 83°, page 667.

Identification—

A: To 10 cc. of a cold, saturated solution of Vanillin add 3 to 5 drops of ferric chloride T.S.: a blue color is produced. When this mixture is heated at

about 80° for a few minutes, the blue color changes to brown, and, when cooled, it deposits a white or nearly white precipitate.

B: Vanillin is extracted completely from its solution in ether by shaking with a saturated solution of sodium bisulfite, from which it is precipitated by acids.

C: A cold solution of Vanillin, when treated with lead subacetate T.S., yields a white precipitate, which is sparingly soluble in hot water but soluble in acetic acid.

Loss on drying—When dried over sulfuric acid for 4 hours, Vanillin loses not more than 1 per cent of its weight.

Residue on ignition—Vanillin yields not more than 0.05 per cent of residue on ignition, page 685.

Packaging and storage—Preserve Vanillin in tight, light-resistant containers.

Vinyl Ether

VINYL ETHER

Æther Vinylicus

Æther. Vinyl.—Divinyl Oxide

C_4H_6O $CH_2:CH.O.CH:CH_2$ Mol. wt. 70.09

Vinyl Ether for anesthesia consists of about 96 per cent of C_4H_6O and about 4 per cent of dehydrated alcohol. It may contain 0.025 per cent of a harmless preservative.

Caution—Vinyl Ether to be used for anesthesia must be preserved in tight containers of not more than 200-cc. capacity and is not to be used if the original container has been opened longer than 48 hours.

Description—Vinyl Ether occurs as a clear liquid having a characteristic odor. It is colorless or has a slight purple fluorescence derived from the preservative. It boils between 28° and 31°.

Solubility—Vinyl Ether is slightly soluble in water, but is miscible with alcohol, acetone, chloroform, and with ether.

Specific gravity—The specific gravity of Vinyl Ether is between 0.767 and 0.771.

Non-volatile matter—Allow 10 cc. of Vinyl Ether to evaporate at room temperature in a tared evaporating dish, and dry the residue at 50° for 2 hours: the weight of the residue does not exceed 2.0 mg.

Acid or alkali—Agitate 5 cc. of Vinyl Ether in a small, stoppered cylinder with 2 cc. of recently boiled and cooled water for 30 seconds: the water layer does not affect blue or red litmus paper.

Foreign odor—Place 10 cc. of Vinyl Ether in a clean, dry, small evaporating dish and allow it to evaporate spontaneously to about 1 cc.: no foreign odor is perceptible during the evaporation. Pour the residue on a piece of clean, odorless filter paper: no foreign odor other than that of alcohol is perceptible as the last portions disappear from the paper.

Aldehyde—To 5 cc. of Vinyl Ether, contained in a 10-cc. glass-stoppered cylinder, add 1 cc. of a freshly prepared alkaline solution of phloroglucinol (made by dissolving 20 mg. of phloroglucinol in 4 cc. of sodium hydroxide solution [1 in 10] and diluting with water to 50 cc.), stopper the cylinder, and shake it vigorously for 3 minutes. Upon separation the lower layer is not darker than a control made with 5 cc. of benzene and 1 cc. of the phloroglucinol solution.

Chlorine—In one hole of a rubber stopper insert a small separator. Into the other hole insert a glass tube of such length that when the stopper is inserted into a small suction flask the lower end of the tube will be about 1 cm. from the bottom of the flask. Connect this tube with a source of illuminating gas, and connect the side arm of the suction flask to a Bunsen burner placed at a safe distance from the flask. Start the flow of the illuminating gas, and light the burner. Then introduce through the separatory funnel, dropwise, 5 cc. of Vinyl Ether. Allow the flame from the Bunsen burner to impinge on a clean, previously ignited, heavy copper gauze. No green color is perceptible above the gauze. Perform this test in a dark room or against a black background.

Preservation and storage—Preserve Vinyl Ether in tight, light-resistant containers, of not more than 200-cc. capacity.

Water

WATER

Aqua

H_2O Mol. wt. 18.02

Description—Water is a clear, colorless liquid which is practically tasteless and odorless.

Reaction—Place 10 cc. of Water in a test tube, and add 2 drops of methyl red pH indicator: no red color is produced. Another 10-cc. portion of Water does not show a pink or red color on the addition of 2 drops of phenolphthalein T.S.

Heavy metals—To 40 cc. of Water, heated to 50°, add 1 cc. of diluted acetic acid and 10 cc. of freshly prepared hydrogen sulfide T.S., and allow the liquid to stand for 10 minutes. The color of the liquid, when viewed downward over a white surface, is no darker than the color of a mixture of 40 cc. of the same Water with 1 cc. of diluted acetic acid and 10 cc. of distilled water, using matched Nessler tubes for the comparison.

Zinc—To 50 cc. of Water contained in a glass tube add 3 drops of glacial acetic acid and 0.5 cc. of potassium ferrocyanide T.S. The solution shows no more turbidity than that produced by 50 cc. of distilled water in a similar glass tube, treated in the same manner, and viewed downward over a dark surface.

Foreign volatile matter—When heated nearly to the boiling point and agitated, Water evolves no odor.

Total solids—Evaporate 100 cc. of Water to dryness on a water bath, and dry the residue in an oven to constant weight at 100°: not more than 100 mg. of residue remains.

Coliform organisms—Water meets the standards for freedom from coliform organisms required for potable water by the United States Public Health Service

Water, Distilled

DISTILLED WATER

Aqua Destillata

Aq. Dest.

H_2O **Mol. wt. 18.02**

Distilled Water is water purified by distillation.

Caution—Sterile Distilled Water and Distilled Water are not to be used for parenteral administration or in preparations to be used parenterally. For such purpose, Water for Injection, page 601, is to be used.

Description—Distilled Water is a colorless, clear liquid, without odor or taste.
Total solids—Evaporate 100 cc. of Distilled Water to dryness on a water bath, and dry the residue to constant weight at 100°: not more than 1 mg. of residue remains.
Reaction—Add 2 drops of methyl red pH indicator to 10 cc. of Distilled Water in a test tube: no red color is produced. A 10-cc. portion of Distilled Water shows no blue color on the addition of 5 drops of bromothymol blue pH indicator.
Chloride—To 100 cc. of Distilled Water add 5 drops of nitric acid and 1 cc. of silver nitrate T.S.: no opalescence is produced.
Sulfate—To 100 cc. of Distilled Water add 1 cc. of barium chloride T.S.: no turbidity is produced.
Ammonia—To 100 cc. of Distilled Water add 1 cc. of alkaline mercuric potassium iodide T.S.: not more than a faint yellow color is produced.
Calcium—To 100 cc. of Distilled Water add 2 cc. of ammonium oxalate T.S.: no turbidity is produced.
Carbon dioxide—To 25 cc. of Distilled Water add 25 cc. of calcium hydroxide T.S.: the mixture remains clear.
Heavy metals—To 40 cc. of Distilled Water add 1 cc. of diluted acetic acid and 10 cc. of freshly prepared hydrogen sulfide T.S., and allow the liquid to stand for 10 minutes. This liquid, when viewed downward over a white surface, appears no darker than 50 cc. of the same Distilled Water, with 1 cc of diluted acetic acid, matched Nessler tubes being used for the comparison.
Oxidizable substances—Heat 100 cc. of Distilled Water and 10 cc. of diluted sulfuric acid to boiling. Add 0.1 cc. of tenth-normal potassium permanganate, and boil for 10 minutes: the pink color does not completely disappear.

Water, Distilled, Sterile

STERILE DISTILLED WATER

Aqua Destillata Sterilis

Aq. Dest. Steril.

Caution—Sterile Distilled Water and Distilled Water are not to be used for parenteral administration or in preparations to be used parenterally For such purpose, Water for Injection, page 601, is to be used.

Place distilled water in sterile, suitable containers, properly sealed or closed, and sterilize preferably by Process C. See *Sterilization Processes*, page 692.

Sterile Distilled Water meets the requirements of the tests under *Distilled Water* page 599, and the *Sterility Test for Liquids*, page 689.
Packaging and storage—Preserve Sterile Distilled Water in the container in which it was sterilized, and protect from contamination.

WATER FOR INJECTION

Aqua Pro Injectione

Aq. pro Inject.

Water for Injection is water for parenteral use, prepared by distillation. It may be used immediately after distillation for preparing solutions for parenteral use as directed under *Injections*, page 664. It may instead be stored over night at a temperature below or above that at which deterioration or bacterial growth may occur. It may also be packaged and sterilized for future parenteral use, and when so packaged meets the requirements of the *Sterility Test for Liquids*, page 689, and for *Clarity of Solutions* under *Injections*, page 666. Water for Injection does not contain bacteriostatic agents or other substances, page 665, except (1) when it is in a container holding not more than 100 cc., marketed in combination with a medicinal preparation for parenteral administration for which it is to be the solvent; and (2) when it contains 0.1 per cent of citric acid and is marketed in combination with Dried Normal Human Plasma for which it is to be the solvent.

Collect Water for Injection in containers which are clean, well rinsed with either Water for Injection or with freshly distilled water, and which are preferably sterile.

Water for Injection conforms to the requirements and tests under *Distilled Water*, page 599, except that Water for Injection containing bacteriostatic agents or other substances conforms in all respects to the requirements and tests for *Distilled Water* other than as to deviations for which the bacteriostatic agent or other substances are responsible.

Pyrogen Water for Injection meets the requirements of the *Pyrogen Test*, page 679.

Packaging and storage Preserve Water for Injection in hermetic, or in other suitable containers.

Labeling—If bacteriostatic agents or other substances are added to Water for Injection the quanity or proportion of each substance so used shall be indicated on the labeling.

Waters, continued

Wax, White

WHITE WAX

Cera Alba

Cera Alb.—Bleached Beeswax

White Wax is bleached yellow wax.

Description—White Wax is a yellowish white solid, somewhat translucent in thin layers. It has a faint, characteristic odor, is free from rancidity, and is nearly tasteless.

Acid value—The acid value of White Wax is not less than 17 and not more than 24, when determined as directed under *Yellow Wax*, page 602.

Ester value—The ester value of White Wax is not less than 72 and not more than 79, when determined as directed under *Yellow Wax*, page 602.

Other characteristics—In other respects White Wax has the characteristics of *Yellow Wax*, page 602.

Packaging and storage—Preserve White Wax in well-closed containers.

Wax, Yellow

YELLOW WAX

Cera Flava

Cera Flav.—Beeswax

Yellow Wax is the purified wax from the honeycomb of the bee, *Apis mellifera* Linné (Fam. *Apidæ*).

Description—Yellow Wax is a solid, varying in color from yellow to grayish brown. It has an agreeable, honey-like odor, and a faint, characteristic taste. It is somewhat brittle when cold, and presents a dull, granular, noncrystalline fracture when broken. It becomes plastic from the heat of the hand. Its specific gravity is about 0.95.

Solubility—Yellow Wax is insoluble in water, and sparingly soluble in cold alcohol. Boiling alcohol dissolves the cerotic acid and a portion of the myricin, which are constituents of Yellow Wax. It is completely soluble in chloroform, in ether, and in fixed and volatile oils; partly soluble in cold benzene and in carbon disulfide, and completely soluble in these liquids at about 30°.

Melting range—Yellow Wax melts between 62° and 65°, page 667.

Carnauba wax—Place 100 mg. of Yellow Wax in a test tube and add 20 cc. of *n*-butanol. Immerse the test tube in boiling water, and shake the mixture gently until solution is complete. Immerse the test tube in a beaker of water at 60°, and allow it to cool to room temperature. A loose mass of fine, needle-like crystals separates from a clear mother-liquor. Under the microscope the crystals appear

as loose needles or stellate clusters, without the presence of amorphous masses, the latter indicating the presence of carnauba wax.

Fats or fatty acids, Japan wax, rosin, or soap—Boil 1 Gm. of Yellow Wax for 30 minutes with 35 cc. of a solution of sodium hydroxide (1 in 7), the volume being preserved by the occasional addition of water, and cool the mixture: the wax separates without rendering the liquid opaque. Filter the cold mixture through glass wool or asbestos, and add to the filtrate an excess of hydrochloric acid: no precipitate is observed.

Acid value—Warm about 3 Gm. of Yellow Wax, accurately weighed, in a 200-cc. flask with 25 cc. of neutralized dehydrated alcohol until melted, shake the mixture, add 1 cc. of phenolphthalein T.S., and titrate the warm liquid with half-normal alcoholic potassium hydroxide to produce a permanent, faint pink color: the acid value so obtained is not less than 18 and not more than 24, page 646.

Ester value—To the solution resulting from the determination of *Acid value* add 25 cc. of half-normal alcoholic potassium hydroxide and 50 cc. of alcohol, boil the mixture for 4 hours under a reflux condenser, and titrate the excess of the alkali with half-normal hydrochloric acid. Determine the normality of the half-normal alcoholic potassium hydroxide in the same manner as in the test. The ester value so obtained is not less than 72 and not more than 77, page 647.

Packaging and storage—Preserve Yellow Wax in well-closed containers.

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WILD CHERRY

Prunus Virginiana

Prun. Virg.—Wild Black Cherry Bark

Wild Cherry is the stem bark of *Prunus serotina* Ehrhart (Fam. *Rosaceæ*), collected in autumn and carefully dried. Borke, if present, should be removed.

Description—

Unground Wild Cherry—Usually in transversely curved pieces up to 8 cm. in width and from 0.5 to 8 mm. in thickness; outer surface of rossed bark moderate brown to light olive brown, smooth, except for numerous lenticel-scars; outer surface of unrossed bark, weak reddish brown and glossy (young bark) to olive gray (older bark), with light-colored, transversely elongated lenticels or roughened and flaky with light-colored lichens; inner surface weak reddish brown to weak orange, with fine, reticulate striations and numerous minute fissures; fracture short, granular; odor distinct, resembling bitter almond when macerated in water; taste astringent, aromatic, and agreeably bitter.

Histology—A cork of varying thickness (*absent in rossed bark*); a phelloderm of tangentially elongated cells containing chloroplasts; a primary cortex of parenchyma containing starch, tannin and an occasional monoclinic prism of calcium oxalate; a pericycle within which occur a nearly continuous zone of stone cell groups and some fibers; a relatively broad phloem, broken by numerous, curved fissures into scythe-shaped areas, each generally consisting of a curved medullary ray, 1 to 8 cells wide, and a phloem patch, the phloem patches containing starch- and crystal-parenchyma, simple and branched bast-fibers accompanied by

crystal-fibers containing monoclinic prisms of calcium oxalate and scattered groups of stone cells.

Powdered Wild Cherry—Light brown to light yellowish brown; fragments of reddish brown to yellowish orange cork, few; stone cells numerous, frequently elongated, with short branches or of a wavy and irregular outline and with thick, lamellated, porous, strongly lignified walls; sclerenchyma-fibers few, not greatly elongated, frequently accompanied by crystal-fibers, calcium oxalate chiefly in monoclinic prisms but also in rosette aggregates, from 10 to 75 microns in diameter; starch grains simple and compound, nearly spherical, from 2 to 15 microns in diameter.

Packaging and storage—Preserve Wild Cherry in well-closed containers.

Wild Cherry Syrup

WILD CHERRY SYRUP

Syrupus Pruni Virginianæ

Syr. Prun. Virg.

WILD CHERRY, in coarse powder	150 Gm.
GLYCERIN	150 cc.
SUCROSE	675 Gm.
ALCOHOL	20 cc.
WATER, a sufficient quantity,	
To make	1000 cc.

Moisten the wild cherry with 100 cc. of water, pack in a cylindrical percolator, and pour sufficient water upon it to saturate the powder and leave a water stratum above it. Close the lower orifice, cover the percolator, and macerate the drug for 1 hour. Then allow the percolation to proceed rapidly, and collect 400 cc. of percolate, using additional water as the menstruum. Filter the percolate, if necessary, add the sucrose and dissolve it by agitation, then add the glycerin, the alcohol, and sufficient water to make the finished product measure 1000 cc. Strain the Syrup if necessary.

Wild Cherry Syrup may also be made in the following manner:

Prepare a second percolator as described under *Syrup*, page 548, place the sucrose in this percolator, arrange it below the percolator containing the drug, and after the drug has macerated, allow the percolate to drop on the sucrose, and collect the syrup in a bottle which has been gradu-

ated to 1000 cc., and in which the alcohol and glycerin have been placed. Add water to the drug, as necessary, to make the finished Syrup measure 1000 cc.

Alcohol content—From 1 to 2 per cent, by volume, of C_2H_5OH.
Packaging and storage—Preserve Wild Cherry Syrup in tight containers, preferably at a temperature not above 25°.

WOOL FAT

Adeps Lanæ

Adeps Lan.—Anhydrous Lanolin, Refined Wool Fat

Wool Fat is the purified, anhydrous, fat-like substance from the wool of sheep, *Ovis aries* Linné (Fam. *Bovidæ*).

Description—Wool Fat is a brownish yellow, tenacious, unctuous mass, having not more than a slight odor.
Solubility—Wool Fat is insoluble in water, but mixes without separation with about twice its weight of water. It is sparingly soluble in cold alcohol, more soluble in hot alcohol, and freely soluble in ether and in chloroform.
Melting range—Wool Fat melts between 36° and 42°, page 667.
Loss on drying—When dried to constant weight on a water bath with frequent stirring, Wool Fat loses not more than 0.5 per cent of its weight.
Residue on ignition—Wool Fat yields not more than 0.1 per cent of residue on ignition, page 685.
Free alkali—Dissolve 2 Gm. of Wool Fat in 10 cc. of ether and add 2 drops of phenolphthalein T.S.: the liquid is not colored red.
Chloride—Boil 20 cc. of alcohol with 1 Gm. of Wool Fat under a reflux condenser, cool, filter, and add to the filtrate 5 drops of an alcohol solution of silver nitrate (1 in 50): the turbidity, if any, is not greater than that produced in the same volumes of the same reagents by 0.5 cc. of fiftieth-normal hydrochloric acid, page 709.
Water-soluble acids or alkalies—Warm 10 Gm. of Wool Fat with 50 cc. of water on a water bath, constantly stirring the mixture until the Wool Fat is melted: the fat separates completely on cooling, leaving the water layer nearly clear, and neutral to litmus paper. *Use the water layer for the following tests:*
Ammonia—A 10-cc. portion of the solution emits no ammonia vapor when boiled with 1 cc. of sodium hydroxide T.S.
Glycerin—A 10-cc. portion of the filtered solution leaves no sweet residue on evaporation.
Water-soluble oxidizable substances—A 10-cc. portion of the solution does not completely decolorize 0.05 cc. of tenth-normal potassium permanganate within 10 minutes.
Petrolatum—Boil 40 cc. of dehydrated alcohol with 500 mg. of Wool Fat: the solution is clear or not more than opalescent.
Free fatty-acids—The free acids in 10 Gm. of Wool Fat require for neutralization not more than 2 cc. of tenth-normal sodium hydroxide, page 646.
Iodine value—The iodine value of Wool Fat is not less than 18 and not more than 36, using 800 to 850 mg. of the Wool Fat, page 647.
Packaging and storage—Preserve Wool Fat in well-closed containers, preferably at a temperature not above 30°.

Wool Fat, Hydrous

HYDROUS WOOL FAT

Adeps Lanæ Hydrosus

Adeps Lan. Hyd.—Lanolin

Hydrous Wool Fat is wool fat containing not less than 25 per cent and not more than 30 per cent of water.

Description—Hydrous Wool Fat is a yellowish white, ointment-like mass, having not more than a slight odor. Hydrous Wool Fat, heated on a water bath, separates into an upper oily and a lower water layer. When the heating is continued with frequent stirring until the Hydrous Wool Fat ceases to lose weight, a residue remains, which, when melted, is transparent and when cold is a yellowish, tenacious, unctuous mass completely soluble in ether or chloroform and only sparingly soluble in alcohol.

Solubility—Hydrous Wool Fat is insoluble in water.

Loss on drying—When dried to constant weight on a water bath with frequent stirring, Hydrous Wool Fat loses not less than 25 per cent and not more than 30 per cent of its weight.

Other requirements—Hydrous Wool Fat complies with the tests for *Free alkali, Water-soluble acids or alkalies, Chloride, Ammonia, Glycerin* and for *Free fatty-acids*, under *Wool Fat*, page 605, allowance being made for the proportion of water present.

Petrolatum—Hydrous Wool Fat, deprived of water by drying on a water bath, meets the requirements of the test for *Petrolatum* under *Wool Fat*, page 605.

Iodine value—The iodine value of Hydrous Wool Fat, deprived of water by drying on a water bath, is not less than 18 and not more than 36, using 800 to 850 mg. of dried Hydrous Wool Fat, page 647.

Packaging and storage—Preserve Hydrous Wool Fat in well-closed containers, preferably at a temperature not above 30°.

Yeast, Dried

DRIED YEAST

Saccharomyces Siccum

Saccharomy. Sic.—Dry Yeast

Dried Yeast consists of the dry cells of any suitable strain of *Saccharomyces cerevisiæ* Meyen (Fam. *Saccharomycetaceæ*). Dried Yeast may be obtained as a by-product from the brewing of beer which has been made from an extract of cereal grains and hops. The yeast cells are washed free of beer and dried, and may or may not be debittered. These yeasts are commonly known, respectively, as "Brewer's Dried Yeast" and "Debittered Brewer's Dried Yeast." Dried Yeast may be obtained also by growing suitable strains of yeast, using media other than those required for the production of beer, and under appropriate environmental conditions. The yeast thus obtained is commonly known as "Primary Dried Yeast."

Dried Yeast contains not less than 40 per cent of protein and, in each Gm., the equivalent of not less than 0.12 mg. of thiamine hydrochloride, 0.04 mg. of riboflavin, and 0.25 mg. of nicotinic acid.

Description—Dried Yeast occurs as yellowish white to weak yellowish orange flakes, granules, or powder, with an odor and taste characteristic of the type. Dried Yeast is inactive in fermenting power.

Histology—Numerous irregular masses and isolated yeast cells, the latter ovate, elliptical, spheroidal, or elliptic-elongate in shape, some with one or more attached buds; up to 12 microns in length and up to 7.5 microns in width; each with a wall of fungous cellulose surrounding a protoplast containing refractile glycogen vacuoles and oil globules; occasional septated hyphal outgrowths of *Saccharomyces cerevisiæ* and segments of elongated forms of yeast films.

Fillers—Dried Yeast contains no starch, corn meal, or other filler, as determined microscopically.

Bacterial and mold count—Suspend Dried Yeast in sterile water, plate it on nutrient agar, and incubate it at 37.5° for 48 hours: the live bacteria count shall not exceed 7500 per Gm. and the mold count does not exceed 50 per Gm.

Moisture—Dried Yeast contains not more than 7 per cent of moisture as determined under *Moisture Method for Drugs Containing No Constituents Volatile at 100°*, page 712.

Ash—Dried Yeast yields not more than 8 per cent of ash determined as directed under *Total Ash in Vegetable Drugs*, page 711.

Assay for protein—Proceed as directed under *Nitrogen (Total) by the Kjeldahl Method (Method 1)*, page 671. The number of Gm. of nitrogen obtained, multiplied by 6.25, represents the number of Gm. of protein present in the portion of the yeast taken for the assay.

Assay for thiamine hydrochloride—Proceed as directed under *Thiamine Assay, Thiochrome method*, page 705.

Assay for riboflavin—Proceed as directed under *Riboflavin Assay*, page 685.

Assay for nicotinic acid—Proceed as directed under *Nicotinic Acid Assay*, page 669.

Packaging and storage—Preserve Dried Yeast in tight containers.

Labeling—If Dried Yeast is labeled to show its source, it shall be labeled as "Brewer's Dried Yeast," "Debittered Brewer's Dried Yeast," or "Primary Dried Yeast," whichever may be appropriate.

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

Yeast, Dried, Tablets

DRIED YEAST TABLETS

Tabellæ Saccharomycitis Sicci

Tab. Saccharomy. Sic.

Dried Yeast Tablets contain the equivalent of nicotinic acid, riboflavin, thiamine hydrochloride, and protein, corresponding to not less than 95 per cent of the labeled amount of dried yeast.

Assay for protein—Weigh a counted number of not less than 20 Tablets, and reduce them to a fine powder without appreciable loss. Using a suitable aliquot, proceed as directed in the *Assay for protein*, under *Dried Yeast*, page 606.

Assays for nicotinic acid, riboflavin, and thiamine hydrochloride—Using a counted number of not less than 10 Tablets as the quantity of test material to be assayed, proceed as directed under *Nicotinic Acid Assay*, page 669, *Riboflavin Assay*, page 685, and *Thiamine Assay, Thiochrome method*, page 705.

Packaging and storage—Preserve Dried Yeast Tablets in tight containers.

Sizes—Dried Yeast Tablets usually available contain the following amount of dried yeast: 0.5 Gm. (7½ grains).

AVERAGE DOSE—To be determined by the physician in accordance with the needs of the patient.

Yellow Fever Vaccine

YELLOW FEVER VACCINE

Vaccinum Febris Flavæ

Vac. Feb. Flav.

Yellow Fever Vaccine consists of a living culture of an attenuated strain of yellow fever virus, selected for high antigenic activity and safety. It is prepared by culturing the virus in the living embryo of the domestic fowl (*Gallus domesticus*). The resulting culture after appropriate processing is distributed in suitable quantities into ampuls and dried from the frozen state, after which the ampuls are filled with dry nitrogen and hermetically sealed. The Vaccine is rehydrated immediately before use. Yellow Fever Vaccine shall not contain human serum. Yellow Fever Vaccine complies with the requirements of the National Institute of Health of the United States Public Health Service.

Description—Yellow Fever Vaccine is a slightly dull, light orange colored flaky or crust-like desiccated mass. Yellow Fever Vaccine must be free from harmful substances detectable by animal inoculation.

Regulations—The outside label must bear a statement (1) identifying the strain of virus used, (2) that the Vaccine is a live culture, and (3) that the Vaccine has been prepared from infected chick embryo, the manufacturer's lot number of the vaccine, the name, address, and license number of the manufacturer, and the date beyond which the Vaccine may not be expected to retain the potency prescribed by the National Institute of Health of the United States Public Health Service.

Preservation and storage—Preserve Yellow Fever Vaccine in nitrogen filled hermetically sealed ampuls at a temperature preferably below 0° but never above 5° C. throughout the dating period. Preserve the Vaccine during storage by the manufacturer prior to dating preferably at a temperature of minus 20° but never above minus 5°. It must be dispensed in the unopened glass container in which it was placed by the manufacturer.

AVERAGE DOSE—Of the rehydrated and diluted vaccine, subcutaneous, for active immunization, 0.5 cc.

Zinc Oxide

ZINC OXIDE

Zinci Oxidum

Zinc. Oxid.

ZnO Mol. wt. 81.38

Zinc Oxide, when freshly ignited, contains not less than 99 per cent of ZnO.

Description—Zinc Oxide occurs as a very fine, odorless, amorphous, white or yellowish white powder, free from gritty particles. It gradually absorbs carbon dioxide from air.

Solubility—Zinc Oxide is insoluble in water and in alcohol. It dissolves in dilute acids.

Identification—

A: When strongly heated, Zinc Oxide assumes a yellow color which disappears on cooling.

B: A solution of Zinc Oxide in a slight excess of diluted hydrochloric acid responds to the tests for *Zinc*, page 664.

Loss on ignition—When ignited, Zinc Oxide loses not more than 2 per cent of its weight.

Carbonate and color of solution—Mix 2 Gm. of Zinc Oxide with 10 cc. of water, add 30 cc. of diluted sulfuric acid, and heat on a water bath, with constant stirring: no effervescence occurs and the resulting solution is clear and colorless.

Free alkali—Mix 1 Gm. of Zinc Oxide with 10 cc. of hot water, and add 2 drops of phenolphthalein T.S.: if a red color is produced, not more than 0.3 cc. of tenth-normal hydrochloric acid is required to discharge it.

Arsenic—Dissolve 1 Gm. of Zinc Oxide in 20 cc. of diluted hydrochloric acid: a 5-cc. portion of this solution meets the requirements of the test for *Arsenic*, page 618, omitting the treatment with sulfuric and sulfurous acids (8 parts per million).

Iron and many other metals—Cooled 5-cc. portions of the solution obtained in the test for *Carbonate* yield white precipitates with potassium ferrocyanide T.S. and with sodium sulfide T.S.

Lead—Add 2 Gm. of Zinc Oxide to 20 cc. of water, stir well, add 5 cc. of glacial acetic acid, and warm upon a water bath until solution is effected: the addition of 5 drops of potassium chromate T.S. produces no turbidity or precipitate.

Assay—Dissolve about 1.5 Gm. of freshly ignited Zinc Oxide, accurately weighed, and 2.5 Gm. of ammonium chloride in 50 cc. of normal sulfuric acid with the aid of gentle heat, if necessary. When solution is complete, titrate the excess of sulfuric acid with normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of normal sulfuric acid is equivalent to 40.69 mg. of ZnO.

Packaging and storage—Preserve Zinc Oxide in well-closed containers.

Zinc Oxide Ointment

ZINC OXIDE OINTMENT
Unguentum Zinci Oxidi
Ung. Zinc. Oxid.—Zinc Ointment

Zinc Oxide Ointment contains not less than 18.5 per cent and not more than 21.5 per cent of ZnO.

ZINC OXIDE, in very fine powder	200 Gm.
WOOL FAT	70 Gm.
WHITE OINTMENT	730 Gm.
To make	1000 Gm

Levigate the zinc oxide with the wool fat to a smooth paste, and incorporate the mixture with the white ointment (see page 2).

Calcium, magnesium, and other foreign substances—Add to the residue obtained in the *Assay* 6 cc. of diluted hydrochloric acid: no effervescence occurs. Heat the mixture on a steam bath for 10 to 15 minutes: not more than a trace of insoluble residue remains. Filter the solution, dilute the filtrate with water to 10 cc., add ammonia T.S. until the precipitate first formed redissolves, then add 2 cc. each of ammonium oxalate T.S. and sodium phosphate T.S.: not more than a slight turbidity is produced in 5 minutes.

Assay—Weigh accurately in a tared porcelain crucible about 2 Gm. of Zinc Oxide Ointment, heat it gently until melted, and continue the heating, gradually raising the temperature until the mass is thoroughly charred. Ignite the mass strongly until all of the carbonaceous material has been dissipated and the residue is uniformly yellow and the weight is constant. The increase in weight of the crucible represents the quantity of ZnO in the weight of the Ointment taken for the assay.

Zinc Peroxide, Medicinal

MEDICINAL ZINC PEROXIDE
Zinci Peroxidum Medicinale
Zinc. Peroxid. Medic.

Medicinal Zinc Peroxide consists of a mixture of zinc peroxide, zinc carbonate, and zinc hydroxide. It contains not less than 45 per cent of ZnO_2.

Description—Medicinal Zinc Peroxide occurs as a fine, white, or only faintly yellow odorless powder.

Solubility—Medicinal Zinc Peroxide is almost insoluble in water and organic solvents. It is readily soluble in dilute mineral acids.

Identification—

A: A solution of Medicinal Zinc Peroxide in a slight excess of diluted hydrochloric acid, boiled to remove the hydrogen peroxide formed, responds to the tests for *Zinc*, page 664.

B: Shake a small quantity of the Peroxide with a few cc. of water and 1 drop of

diluted sulfuric acid, then add a few cc. of ether and a few drops of potassium dichromate T.S.: the water layer becomes blue: on shaking the mixture the blue color passes into the ether.

Chloride—Add 3 Gm. of Medicinal Zinc Peroxide to 50 cc. of water, and add nitric acid in small portions until it is dissolved, then add 3 cc. more of the acid. Dilute with water to about 100 cc., add, with stirring, exactly 15 cc. of tenth-normal silver nitrate, and heat on a steam bath, protected from light, until the silver chloride has coagulated. Cool, filter, and wash the precipitate with water until the last washing does not react with hydrochloric acid. Then titrate the excess of silver nitrate in the combined filtrate and washings with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. The volume of tenth-normal silver nitrate consumed corresponds to not more than 1.0 per cent of Cl. Each cc. of tenth-normal silver nitrate is equivalent to 3.546 mg. of Cl.

Sulfate—A 500-mg. portion of Medicinal Zinc Peroxide shows no more *Sulfate* than corresponds to 1 cc. of fiftieth-normal sulfuric acid, page 709.

Alkalies and earths—Dissolve 1 Gm. of Medicinal Zinc Peroxide in 50 cc. of water and a slight excess of hydrochloric acid. Boil the solution until hydrogen peroxide is expelled, cool, dilute to about 100 cc. with water, then proceed as described under *Zinc Sulfate*, page 612, beginning with the words "Precipitate the zinc completely." The weight of the residue does not exceed 10 mg.

Heat about 25 Gm. of Medicinal Zinc Peroxide for 4 hours in a 250-cc. cotton-plugged Erlenmeyer flask in an oven at 135° to 140°. Cool the flask and contents to room temperature, mix well, and allow to stand over night. Mix again, and use it for the following two tests:

Reaction—Place 5 Gm. of the heated Medicinal Zinc Peroxide in a 250-cc. flask, add 100 cc. of water, stir thoroughly for 5 minutes, and allow to subside: the pH of the supernatant liquid is not less than 7.0 and not more than 8.5.

Minimum of oxygen evolution—Place 5.0 Gm. of the heated Medicinal Zinc Peroxide in a dry 125-cc. Erlenmeyer flask, add 25 cc. of water at 37.5°, and mix well. Fill the flask with water at 37.5° while swirling the flask to prevent the Peroxide from adhering to the bottom of the flask. Immediately stopper the flask with a suitable stopper, through which is inserted a delivery tube, the inside end of which extends to within about 1.5 cm. of the bottom of the flask. The outside end of the delivery tube is at approximately the same level as the bottom of the stopper, and extends downward into the top of a 50-cc. burette which is filled to the lowest graduation with water. The delivery tube is also filled with water when the stopper is inserted in the flask. Immerse the flask to the level of the inner side of the stopper in a bath at 37.5° and maintain at this temperature for 24 hours. At the end of this period the volume of water collected in the burette is not less than 12 cc., and during the last 4 hours the water displaced is not less than 0.3 cc. per hour.

Assay—Weigh accurately about 500 mg. of Medicinal Zinc Peroxide, transfer to a 250-cc. flask containing 50 cc. of diluted sulfuric acid, and shake gently until dissolved, then titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 4.869 mg. of ZnO_2.

Packaging and storage—Preserve Medicinal Zinc Peroxide in tight containers.

Zinc Stearate

ZINC STEARATE

Zinci Stearas

Zinc. Stear.

Zinc Stearate is a compound of zinc with variable proportions of stearic acid and palmitic acid, containing the equivalent of not less than 13 per cent and not more than 15.5 per cent of ZnO.

Description—Zinc Stearate occurs as a fine, white, bulky powder, free from grittiness, and has a faint, characteristic odor. It is neutral to moistened litmus paper.
Solubility—Zinc Stearate is insoluble in water, in alcohol, and in ether.
Identification—
A: Heat 1 Gm. of Zinc Stearate with a mixture of 25 cc. of water and 5 cc. of hydrochloric acid: fatty acids are liberated, floating as an oily layer on the surface of the liquid, and the water layer responds to the tests for *Zinc*, page 664.
B: Mix 25 Gm. of Zinc Stearate with 200 cc. of hot water, then add 60 cc. of diluted sulfuric acid, and heat the mixture, with frequent stirring, until the fatty acids separate cleanly as a transparent layer. Wash the fatty acids with boiling water until free from sulfate, collect them in a small beaker, and warm on a steam bath until the water has separated and the fatty acids are clear. Allow the acids to cool, pour off the water layer, then melt the acids, filter into a dry beaker while hot, and dry for 20 minutes at 100°: the *solidification temperature of the fatty acids is not below 54°, page 645.*

Alkalies and earths—Boil 2 Gm. of Zinc Stearate with 50 cc. of water and 10 cc. of hydrochloric acid, filter while hot, and wash the separated acids with about 50 cc. of hot water. Render the combined filtrate and washings alkaline with ammonia T.S., add ammonium sulfide T.S. to precipitate the zinc completely, dilute with water to 200 cc., mix well, and filter. To 100 cc. of the clear filtrate add 0.5 cc. of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 10 mg.

Assay—Boil about 1 Gm. of Zinc Stearate, accurately weighed, with 50 cc. of tenth-normal sulfuric acid for 10 minutes, or until the stearic acid layer is clear, adding more water, as necessary, to maintain the original volume, cool, and filter. Wash the filter and flask thoroughly with water until the last washing is not acid to litmus paper, dissolve 1 Gm. of ammonium chloride in the filtrate and washings, and titrate the excess of sulfuric acid with tenth-normal sodium hydroxide, using methyl orange T.S. as the indicator. Each cc. of tenth-normal sulfuric acid is equivalent to 4.069 mg. of ZnO.

Packaging and storage—Preserve Zinc Stearate in well-closed containers.

Zinc Sulfate

ZINC SULFATE
Zinci Sulfas
Zinc. Sulf.

$ZnSO_4.7H_2O$ Mol. wt. 287.55

Zinc Sulfate contains not less than 55.6 per cent and not more than 61.0 per cent of $ZnSO_4$, corresponding to not less than 99 per cent of the hydrated salt ($ZnSO_4.7H_2O$).

Description—Zinc Sulfate occurs in colorless, transparent prisms, or small needles. It may occur as a granular, crystalline powder. It is without odor and has an astringent, metallic taste. It is efflorescent in dry air. Its solutions are acid to litmus paper.
Solubility—One Gm. of Zinc Sulfate dissolves in 0.6 cc. of water and in about 2.5 cc. of glycerin. It is insoluble in alcohol.
Identification—A solution of Zinc Sulfate responds to the tests for *Zinc*, page 664, and for *Sulfate*, page 663.

Limit of acidity—A solution of Zinc Sulfate (1 in 20) is not colored pink by methyl orange T.S.

Alkalies and earths—Dissolve 2 Gm. of Zinc Sulfate in about 150 cc. of water, contained in a 200-cc. volumetric flask. Precipitate the zinc completely by means of ammonium sulfide T.S., and add sufficient water to make the mixture measure 200 cc. Mix well, and filter through a dry filter, rejecting the first portion of the filtrate. To 100 cc. of the subsequent filtrate add a few drops of sulfuric acid, evaporate to dryness in a tared dish, and ignite. The weight of the residue does not exceed 5 mg.

Arsenic—A solution of Zinc Sulfate meets the requirements of the test for *Arsenic*, page 618.

Heavy metals—Dissolve 500 mg. of Zinc Sulfate in 5 cc. of water, and transfer the solution to a Nessler tube. Add 10 cc. of a solution of potassium cyanide (1 in 10), mix well, and allow the mixture to become clear. Designate the tube containing this solution as "A." In a similar matched Nessler tube "B", place 5 cc. of water, add exactly 0.5 cc. of standard lead solution, page 657, and 10 cc. of potassium cyanide solution (1 in 10). Add to the solution in each tube 0.1 cc. of sodium sulfide T.S. Mix the contents of each tube, and allow to stand for 5 minutes. Viewed downward over a white surface, the solution in "A" is no darker than that in "B," indicating not more than 10 parts per million of heavy metals.

Assay—Dissolve about 1 Gm. of Zinc Sulfate, accurately weighed, in about 100 cc. of water. Heat the solution to about 90°, and add sodium carbonate T.S., dropwise, to precipitate all of the zinc. Avoid a large excess of sodium carbonate. Boil the mixture for about 5 minutes, and set it aside to allow the precipitate to subside. Collect the precipitate in a tared Gooch crucible, and wash with hot water until the last washing is free from alkali. Dry the residue, ignite, and weigh it. The weight of zinc oxide thus obtained, multiplied by 1.984, indicates its equivalent in $ZnSO_4$.

Packaging and storage—Preserve Zinc Sulfate in well-closed containers.

GENERAL TESTS, PROCESSES AND APPARATUS

Absorbency of Purified Cotton

Absorbency Test for Purified Cotton—Take 1-Gm. portions of purified cotton from five different parts of the package, pulling, not cutting, the samples. Prepare a test basket from copper wire approximately 0.4 mm. in diameter (No. 26 B. & S.) in the form of a cylinder approximately 5 cm. in diameter and 8 cm. deep, with spaces between the wires of approximately 2 cm., the basket weighing not more than 3 Gm.

Place 5 Gm. of the purified cotton in the basket, and hold the basket on its side approximately 12 mm. above the surface of water at 25°, ± 1°. Allow the basket to drop to the water and determine the time in seconds required for complete submersion, using a stop watch.

Remove the basket from the water and allow it to drain for 10 seconds in the same horizontal position, then place it immediately in a tared beaker, cover with a tared watch glass, and weigh, deducting the weight of the test basket and of the purified cotton to find the weight of water absorbed.

Absorption Coefficient (Extinction Coefficient) in Ultra-Violet

The radiation spectrum is normally divided into three essential regions: the infra-red, the visible, and the ultra-violet; the latter usually refers to the region from 4500 to 2000 Ångströms.

When radiation passes through any homogeneous medium it emerges diminished in energy. This loss in energy is due to a variety of causes, by far the most important of which is normally absorption. The magnitude of the absorption is a function of the frequency (or its reciprocal the wave length) of the radiation being absorbed, of the nature of the medium in which the absorption takes place, and the length of the light path. The extinction coefficient is, therefore, represented by the following expression:

$$E_M = \frac{d}{c \times l}, \text{ and } d = \log_{10}\frac{1}{t}$$

Where E_M is the molecular extinction coefficient (absorption coefficient), d the optical density, c the concentration in gram-molecules per liter, and l the length of the light path in centimeters; t is the transmittance represented by the ratio I/I_0, where I is the intensity of the emergent light and I_0 the intensity of the incident light.

If the molecular weight of a substance under measurement is not known, then E is usually expressed in weight units (as grams per 100 cc. of solution) and thus is characterized by such weight units. If grams per 100 cc. of solution are used, E is designated by $E^{1\%}_{1\,\mathrm{cm.}}$

Ultra-violet absorption measurements are made with an instrument called an ultra-violet spectrophotometer. The measurements are made with solutions of the substance to be examined; hence it is necessary to use solvents and cells transparent in the ultra-violet. Among such solvents are water, saturated aliphatic alcohols, saturated aliphatic ethers, saturated hydrocarbons and their chlorinated derivatives such as carbon tetrachloride, chloroform, etc. These solvents should be purified before use. The cells must be of quartz since glass is opaque in the ultra-violet.

Attention should be called to two important considerations in spectrophotometry. First, because of the wide variation in the design of various spectrophotometers, the resolving power of each differs, so that the values of the determined extinction coefficients also vary. Consequently, it is necessary to calibrate the instrument in terms of a suitable, stable standard. Second, the applicability of Beer's law to a particular substance should be tested by establishing the existence of a linear relationship between the optical density and the concentration.

For a comprehensive treatment of spectrophotometry the reader is referred to:

Brode, W. R., Chemical Spectroscopy, 1939.
Twyman and Allsopp, The Practice of Spectrophotometry.
Miller, E. S., Quantitative Biological Spectroscopy, 1940.

Alcohol Determination

General Process—Measure accurately not less than 25 cc. of the liquid in which the alcohol is to be determined, and note its temperature. Transfer it to a suitable distilling apparatus and, if the alcohol content is thought to be not more than 30 per cent, dilute it with an equal volume of water, using the water to rinse the vessel that was used for measuring unless this vessel is a graduated pipette which has been standardized on the basis of the amount delivered. Distil, and collect a volume of distillate of about 2 cc. less than the volume of the original test liquid, adjust to the temperature at which the original test liquid was measured, add sufficient water to measure exactly the original volume of the test liquid and mix thoroughly. Determine the specific gravity of the liquid at 25°, and from this result ascertain the percentage, by volume, of alcohol contained therein, see *Alcoholometric Table*, page 905. The proportion of alcohol, by volume, in the distillate equals that in the liquid examined.

If the liquid under examination contains more than 30 per cent of alcohol, proceed as directed above, except: dilute the sample with about twice its volume of water and collect a volume of distillate about 2 cc. less than twice the volume of the original test liquid, bring to the temperature at which the original liquid was measured, add sufficient water to measure exactly twice the original volume of the test liquid, and determine its specific gravity. The proportion of alcohol, by volume, in this distillate, as ascertained from its specific gravity, equals one-half that in the liquid examined.

The distillate must be clear or only slightly cloudy, and must not contain more than traces of volatile substances other than alcohol and water.

This general method is suitable for examining most fluidextracts and tinctures provided the capacity of the distilling flask is sufficient (commonly two to four

times the volume of the liquid to be distilled) and the rate of distillation is such that clear distillates are produced. Some alcoholic preparations will, however, require special treatment or the observance of special precautions to yield suitable distillates. If distillates are cloudy, they may be clarified by agitation with talc, or with precipitated calcium carbonate, and filtered, after which the temperature of the filtrate is adjusted and the alcohol determined from the specific gravity. All of this should be done under conditions that will minimize the loss of alcohol by evaporation.

Frothing—Liquids which froth to a troublesome extent during distillation may be distilled by strongly acidifying with phosphoric or sulfuric acid, or by the addition of a slight excess of calcium chloride solution, or a little paraffin or yellow wax.

Bumping—Liquids that tend to bump when heated (particularly resinous solutions) may be distilled by making them alkaline with magnesia magma or by placing pieces of pumice, glass beads, or similar materials in the distilling flask with the liquid, or by similar means of distributing the heat.

Glycerin—Liquids that contain glycerin must be diluted with sufficient water so that the residue, after distillation, will contain at least 50 per cent of water.

Iodine—All solutions of iodine must be deprived of free iodine, before being distilled, by treatment with powdered zinc, or by decolorization with just sufficient solution of sodium thiosulfate followed by a few drops of sodium hydroxide T.S. to fix volatile sulfur compounds.

Volatile Substances—Spirits, elixirs, tinctures, etc., that contain appreciable proportions of volatile materials other than alcohol and water, such as volatile oils, chloroform, ether, camphor, etc., are treated as follows: Mix the accurately measured liquid with about an equal volume of saturated solution of sodium chloride in a separator, then add a volume of petroleum benzin equal to the sample, and shake the mixture to extract the interfering volatile ingredients. Draw off the separated lower layer, and extract the benzin solution with two successive portions of a saturated solution of sodium chloride, using about one-half as much each time as was used in the first extraction mixture. Combine the saline solutions, and distil the mixture in the usual way, collecting a volume of distillate having a simple ratio to the volume of the original liquid.

If a troublesome emulsion develops in the liquid mixture when shaken with the benzin, dilute a fresh portion of the original liquid with water and distil it as directed in the general process. Then treat this distillate as directed above, using petroleum benzin and sodium chloride solution, and distil the saline solution so produced to obtain a distillate which is free from volatile substances other than alcohol and water.

In preparing **collodion** for distillation, use water in place of the saturated solution of sodium chloride directed above.

If volatile oils are present in small proportions only, and a cloudy distillate is obtained, the benzin treatment not having been employed, the distillate may be clarified and rendered suitable for the specific gravity determination by shaking it with about one-fifth its volume of petroleum benzin, or by filtering it through a thin layer of talc.

Other Preparations Requiring Special Treatment—Preparations containing free ammonia, such as **aromatic ammonia spirit**, must be rendered slightly acid with sulfuric acid before being distilled. If **volatile acids** are present, the preparation must be rendered slightly alkaline with sodium hydroxide.

Preparations containing soap, such as chloroform liniment, camphor and soap liniment, and soft soap liniment are treated with an excess of sulfuric acid to effect decomposition of the soap before they are extracted with petroleum benzin as directed in the general process.

Alkali Salts of Organic Acids

Heat about 2 Gm. of the organic salt, accurately weighed, in a platinum or porcelain crucible (do not use platinum for lithium salts), at first very gently, then gradually raise the temperature until the salt is thoroughly carbonized. The final temperature must not exceed a dull red heat and the flame of the burner must not come in contact with the carbonized mass. After allowing the carbonized mass to cool, disintegrate it with the aid of a stout glass rod, and transfer the mass and the crucible to a beaker. Add 50 cc. of water and exactly 50 cc. of half-normal sulfuric acid, cover the beaker with a watch glass, and boil the contents for 30 minutes. Filter the solution, and wash the residue with hot water until the washings cease to redden blue litmus paper. Determine the residual acid in the cooled filtrate by titration with half-normal sodium hydroxide, using methyl orange T.S. as the indicator. The volume of the acid consumed, multiplied by the proper equivalent of the salt, represents the quantity of the salt present in the quantity taken.

If desirable, or if more convenient, 300 to 400 mg. of the organic salt may be used for the assay, in which case tenth-normal sulfuric acid and tenth-normal sodium hydroxide are used in place of half-normal sulfuric acid and half-normal sodium hydroxide, respectively.

This assay is not used for alkali salts of organic acids containing sulfur.

Anti-Anemia Preparations

To meet the specifications of this Pharmacopœia, liver, stomach, or other preparations intended for the treatment of Addisonian pernicious anemia are to be approved by the U. S. P. Anti-anemia Preparations Advisory Board.

A. Applications for approval shall be submitted to the Chairman of the Board by manufacturers on special forms, seven copies being required.

B. The application shall include:

(1) Statement of the species of animal liver or stomach used.

(2) Statement of the conditions under which the raw material is obtained, handled, and stored prior to manufacture.

(3) Description of the facilities used in collecting, transporting, storing, manufacturing, and packaging the article.

(4) Description of the methods and the controls used for the manufacture, processing, and packaging of the drug. Description and composition of the final product with a statement of the total solids and the amount of the preparation in final form derived from 100 Gm. of original organ. If a product contains material derived from more than one source, such data should be given with respect to each component. The pH of products for parenteral use.

(5) Description of the controls employed in assuring uniformity in strength, quality, and purity of the drug, and of maintaining the identity of each lot.

(6) Clinical data from the treatment of cases of Addisonian pernicious anemia in a specified manner with the product in question. Seven copies of the data shall be presented to the Board on special forms supplied by the Board.

(7) All labeling to be used upon the finished product, seven copies being required.

C. (1) If the data submitted satisfy the Board that the product manufactured as described and having the potency indicated by the clinical data is of a suitable strength, quality, and purity for the treatment of Addisonian pernicious anemia, the Board will inform the applicant of the approval of the product and will assign a potency for it.

(2) The potency of preparations as defined by the Board shall be stated on the label as follows:

1 (cc., Gm., capsule, etc.) of material prepared by the method employed in producing the contents of this (bottle, vial, package) constitute(s) (no.) U. S. P. units (oral or injectable).

or alternatively as follows:

. . . (no.) (Gm. or cc.) (capsules, teaspoons, etc.) of material prepared by the method employed in producing the contents of this (bottle, vial, package) constitute(s) 1 U. S. P. unit (oral or injectable). [Unless the small size of individual containers (*e. g.*, 1 or 2 cc.) requires abbreviation for adequate legibility.]

(3) The labeling shall bear a statement of the average dose of the product. The dose so stated shall be a quantity which provides administration at the rate of not less than 1 U. S. P. Unit a day whether given daily or at longer intervals.

D. A U. S. P. unit is that amount of an otherwise acceptable product which produces, when administered daily, clinical and hematopoietic responses in Addisonian pernicious anemia that are considered by the Board to be satisfactory.

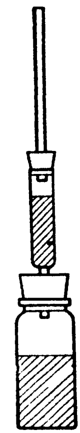
E. Approved liver, stomach, or other preparations relabeled or repackaged by a person other than the original manufacturer or packer are required to have the approval of the Board.

Arsenic Test

Reagents satisfactory for use in the arsenic test and in the preparation of the chemical for the test produce either no stain in a blank test or a stain which is scarcely perceptible

Test Apparatus—Prepare a generator as follows (see the illustration): Select a generator bottle of about 50-cc. capacity having a mouth about 2.5 cm. in diameter, and provide a well-fitting rubber stopper suitably perforated. Through the perforation insert a vertical exit tube about 12 cm. in total length and 1 cm. in diameter along the entire upper portion (for about 8 cm.) and constricted at its lower extremity to a tube of about 4 cm. in length and about 5 mm. in diameter. The smaller portion of the tube should extend but slightly below the stopper. Place in the tube a pledget of purified cotton, 5 cm. in length and extending downward from a point 3 cm. below the top of the tube. Moisten the pledget of cotton in the generator exit tube uniformly with a mixture of equal volumes of lead acetate T.S. and water. To remove the excess of lead acetate solution from the cotton and adhering droplets from the walls of the tube, apply gentle suction to the constricted end of the tube. In the

upper end of this tube, insert through a tightly fitting, perforated rubber stopper a glass tube 12 cm. in length, having an internal diameter of from 2.5 to 3 mm. Place a strip of mercuric bromide test paper (page 840) in this tube, bending the upper end of the strip so that it will retain its position. This strip extends to within about 2 cm. of the perforated rubber stopper and must not be placed in the tube until the test is to be made. This tube must be thoroughly cleaned and dried each time it is used.



Arsenic Test Apparatus

Standard Arsenic Test Solution—Dissolve 100 mg. of arsenic trioxide which has been finely pulverized, dried over sulfuric acid and accurately weighed, in about 5 cc. of a 20 per cent solution of sodium hydroxide. Neutralize the solution with diluted sulfuric acid, and add 10 cc. more of diluted sulfuric acid and sufficient recently boiled water to bring the volume of the solution to exactly 1000 cc. at 25°. Accurately measure 10 cc. of this solution, transfer it to a 1000-cc. flask, and add 10 cc. of diluted sulfuric acid and sufficient recently boiled water to make exactly 1000 cc. of solution at 25°. Use this solution, which contains 1 microgram of arsenic trioxide in each cc. (at 25°) in preparing the standard stain. Keep this solution in a glass-stoppered bottle. Make fresh solutions when new standard stains are to be prepared.

Preparation of the Chemical to be Tested—Add 1 cc. of sulfuric acid to 5 cc. of a solution of the chemical substance (1 in 25), unless another quantity is directed in the monograph. This acidulation is not necessary in the case of inorganic acids. Now, unless especially directed otherwise, add 10 cc. of sulfurous acid. Evaporate the liquid in a small beaker, on a water bath, until it is free from sulfurous acid and has been reduced to about 2 cc. in volume. Dilute this evaporated liquid to 5 cc. with water. Substances subjected to special treatments directed in the monographs need not be further prepared for testing.

The Test

Preparation of the Standard Stain—Place in the generator bottle 5 cc. of potassium iodide T.S., 2 cc. (accurately measured at 25°) of the standard arsenic T.S., 5 cc. of acid stannous chloride T.S., and 28 cc. of water. Now add 1.5 Gm. of granulated reagent zinc (in No. 20 powder), and immediately insert the stopper containing the exit tubes prepared according to the description under *Test Apparatus*. Keep the generator bottle immersed in water at 25° during the period of the test. If the reaction is too violent, the stain will not take the form of a distinctive band, and the comparison of color intensity will be difficult. After the test has continued for 1 hour, remove the mercuric bromide test paper and place it in a clean, dry tube for comparison. This stain represents 2 micrograms of arsenic trioxide. Since light, heat, and moisture cause the stain to fade rapidly, comparison should be made as soon as possible. The stained test papers may be preserved by dipping in hot, melted paraffin or by keeping them over phosphorus pentoxide, protected from light.

Testing the Chemical—Place in the generator bottle 5 cc. of potassium iodide T.S., 5 cc. of the solution to be tested for arsenic, and add 5 cc. of acid stannous

chloride T.S. Set the apparatus aside at room temperature for a period of 10 minutes, then add 25 cc. of water and 1.5 Gm. of granulated reagent zinc (in a No. 20 powder), and immediately insert the stopper with exit tubes, as previously described under *Preparation of the Standard Stain.* Keep the generator bottle immersed in water at 25° during the period of the test. When the evolution of hydrogen has proceeded actively for 1 hour, remove the mercuric bromide test paper, and carefully compare the stain upon it with the standard stain prepared as previously described.

Arsenic Limit—The stain produced by the chemical tested does not exceed in length or intensity of color that prepared as the standard, indicating not more than 10 parts of arsenic trioxide per million parts of the substance being tested.

Interfering Chemicals—*Antimony*, if present in the substance being tested, will produce a gray stain. *Sulfites*, *sulfides*, *thiosulfates*, and other compounds which liberate hydrogen sulfide or sulfur dioxide when treated with sulfuric acid must be oxidized by means of nitric acid and then reduced by means of sulfur dioxide as directed under *Preparation of the Chemical to be Tested* before they are placed in the apparatus. Certain *sulfur compounds* as well as *hydrogen phosphide* give a bright yellow band on the test paper. If *sulfur compounds* are present, a darkening of the purified cotton, previously moistened with lead acetate T.S., will occur. If such is the case, the operation as directed under *Preparation of the Chemical to be Tested* must be repeated upon a fresh portion of the solution being tested and greater care must be used in effecting the complete removal of the sulfurous acid. In testing hypophosphites, special care should be observed to oxidize completely the solution being tested as directed, otherwise the evolution of hydrogen phosphide may result in a yellow stain which might be confused with the orange yellow color produced by arsine. The stain produced by hydrogen phosphide is differentiated from that given by arsine by moistening it with ammonia T.S. A stain caused by arsine will become dark when so treated, but a stain produced by hydrogen phosphide will not materially change in color. The test apparatus must be thoroughly cleaned and dried immediately before and after use.

Ascorbic Acid Assay

Extracting Solution—Dissolve 15 Gm. of metaphosphoric acid and 40 cc. of glacial acetic acid in sufficient water to make 500 cc. Store in a cool place. This solution must be used within 2 days after it is prepared.

Standard Dichlorophenol-Indophenol Solution—To 50 mg. of 2,6-dichlorophenol-indophenol sodium, which has been stored in a desiccator over soda-lime, add 50 cc. of water containing 42 mg. of sodium bicarbonate, shake vigorously, and when the dye is dissolved dilute to 200 cc. with water. Filter through a No. 588 (S. and S.) filter paper, or its equal, into an amber, glass-stoppered bottle. Standardize the dichlorophenol-indophenol solution as follows: Accurately weigh 100 mg. of U. S. P. Ascorbic Acid Reference Standard, transfer it to a 100-cc. glass-stoppered volumetric flask with the aid of the extracting solution, and add sufficient extracting solution to make 100 cc. at room temperature. Immediately transfer 2 cc. of the ascorbic acid solution to a 50-cc. Erlenmeyer flask containing 5 cc. of the extracting solution, and titrate rapidly with the dichlorophenol-indophenol solution until a distinct rose-pink color persists for at least 5 seconds. Prepare a blank titration by titrating 7 cc. of the extracting solution plus a volume of water equal to the volume of the dichlorophenol-indophenol solution used in titrating the ascorbic acid solution. The concentration

of the standard solution is expressed in terms of its equivalent in milligrams of ascorbic acid.

Assay Procedure—Place a 2-cc. aliquot, containing the ascorbic acid obtained as directed in the specific monograph, in a 50-cc. Erlenmeyer flask, add 5 cc. of the extracting solution, and titrate with the standard dichlorophenol-indophenol solution until a rose-pink color persists for at least 5 seconds. Prepare a blank titration by titrating 6 cc. of the extracting solution plus a volume of water equal to the standard dichlorophenol-indophenol solution used in the above titration. From the ascorbic acid equivalent of the standard dichlorophenol-indophenol solution, determine the ascorbic acid content of the assay solution.

Bacteriological Examination of Gelatin

Preparation of Sample—Employ aseptic conditions throughout.

Use preferably a powdered sample. If the gelatin is in sheets, flakes, or shreds, grind it under aseptic conditions through a sterile grinder into a sterile bag or other sterile container. After mixing thoroughly, weigh 5 Gm. of the powdered sample, and place it in a sterile dilution bottle containing 95 cc. of sterile water. After the gelatin is thoroughly wetted, place the container in a water bath, heated to between 40° and 45°. When the contents become uniformly heated, shake well until solution is complete.

Dilutions—Dilute 20 cc. of the freshly prepared (1 in 20) solution with 80 cc. of sterile water to make a 1 in 100 solution. By decimal dilution, prepare 1 in 1000 and 1 in 10,000 dilutions of the dissolved gelatin. If the gelatin is known to be of good quality, the 1 in 20 and 1 in 100 dilutions will suffice. The additional weaker solutions are to be made for gelatin samples known or thought to possess a high bacterial content. Shake each dilution vigorously at least twenty-five times before a second dilution is made from it or before a sample is removed for plating.

Plating for Total Count—Use sterile pipettes graduated to deliver 1 cc., and glass-covered Petri dishes 10 cm. in diameter and 15 mm. in depth for plating.

Plate out in duplicate 1 cc. each of the 1 in 20, 1 in 100, and other dilutions, if necessary. Plating should be done immediately after the dilutions are prepared. Place 1 cc. of the dilution in a sterile Petri dish, add to the Petri dish 10 cc. of liquefied nutrient agar at a temperature of 40°. Raise the cover of the Petri dish just enough for the introduction of the pipette or culture medium. Flame the lips of all flasks, test tubes, and other containers used in delivering the medium. Mix the contents of the Petri dish thoroughly by tilting and rotating the dish. All plates are to be solidified as quickly as possible and, after inverting all glass-covered plates, incubate them for 72 hours at 37°. Count by preference the plates having between 30 and 300 colonies. Enumerate and express results in terms of bacteria per Gm. of gelatin. Counting is to be done with a lens of 2.5 diameter magnification, with a focal distance of 3.5 inches.

Presence of Escherichia coli—Inoculate fermentation tubes containing litmus lactose bouillon in duplicate or triplicate with 1-cc. portions of the 1 in 100 freshly prepared dilution, and incubate at 37° for 48 hours. Examine each tube at the end of 24 and 48 hours. If gas is produced in one or more of the fermentation tubes, make streak cultures therefrom as soon as possible after gas formation occurs, on Endo's medium or on eosin-methylene blue agar, and incubate these at 37° for 24 hours. Typical colonies are positive evidence of the presence of *E. coli* in a 1 in 100

dilution of the gelatin under examination. Transfer organisms from at least two of these typical colonies each to an agar slant and a fermentation tube containing litmus lactose bouillon. If typical colonies have not developed within 24 hours on Endo's medium or eosin-methylene blue agar, incubate the inoculated plates for another 24 hours, after which at least two of the colonies considered most likely to be species of the *coli-ærogenes* group are transferred each to an agar slant and fermentation tube containing litmus lactose bouillon. Incubate the agar slants at 37° for 24 hours and examine the growth microscopically after staining by Gram's method. Incubate the inoculated fermentation tubes at 37° until gas production is noted, but the incubation period is not to exceed 48 hours. Report *E. coli* as absent in the 1 in 100 dilution of gelatin inoculated in the original fermentation tubes if gas is not produced after 48 hours of incubation at 37°. If gas is produced, *E. coli* is reported as being present if the confirmatory evidence is positive and *E. coli* is reported as being absent if the confirmatory tests are negative. Positive confirmatory evidence is the formation of gas in litmus lactose bouillon from colonies on Endo's medium or on eosin-methylene blue agar and the demonstration of Gram-negative, non-spore forming bacilli in the agar cultures.

Culture Media

Endo's Medium—

Lactose	10 Gm.
Dibasic Potassium Phosphate	3.5 Gm.
Sodium Carbonate, anhydrous	1 Gm.
Basic Fuchsin	0.5 Gm.
Sodium Bisulfite	2.5 Gm.
Alcohol	5 cc.
Water	35 cc.
Nutrient Agar (need not have been sterilized, but if not sterile must be freshly prepared)	960 cc.

Dissolve the lactose and the dibasic potassium phosphate in the hot liquefied nutrient agar, the sodium carbonate in 10 cc. of water, the basic fuchsin in the alcohol, and the sodium bisulfite in 25 cc. of water. Add the sodium carbonate solution, the fuchsin solution, and the sodium bisulfite solution to the nutrient agar solution, mixing well after each addition. Place in suitable containers, and sterilize by Process D, page 695, or by any other adequate and suitable method.

When hot, Endo's Medium has a red or pink color, which becomes a faint flesh color or disappears upon cooling. It has a hydrogen-ion concentration equivalent to a pH of 7.6 to 8.0. It is preferable to prepare Endo's Medium freshly as needed as it deteriorates upon standing, especially if exposed to light.

Eosin-methylene blue Agar—

Peptone	10 Gm.
Dibasic Potassium Phosphate	2 Gm.
Agar, finely shredded	15 Gm.
Lactose, in sterile 20 per cent solution	50 cc.
Eosin Y, in 0.2 per cent solution	20 cc.
Methylene Blue, in 0.5 per cent solution	20 cc.
Water	1000 cc.

Dissolve the peptone, dibasic potassium phosphate, and agar in the water by heating in an autoclave for 15 minutes at 15 pounds pressure or by boiling in a water bath. Replace any of the water lost by heating. Adjustment of the pH and filtration of the medium are not required. Place 100-cc. quantities in flasks and sterilize by heating in an autoclave for 15 minutes at 15 pounds pressure (121.5°).

Just prior to use, liquefy the medium by means of heat and to each flask containing 100 cc. add 5 cc. of the lactose solution, 2 cc. of the eosin Y solution, 2 cc. of the methylene blue solution, and mix well.

Litmus Lactose Bouillon—

Beef Extract	3 Gm.
Peptone	10 Gm.
Lactose	10 Gm.
Water, a sufficient quantity, to make	1000 cc.
Litmus Test Solution, a sufficient quantity.	

Dissolve the beef extract, the peptone, and the lactose in 975 cc. of water with the aid of heat; add sufficient normal sodium hydroxide to bring the hydrogen-ion concentration to pH 7.4, or to 0.2 higher than the pH desired in the finished broth, and filter. Add sufficient litmus test solution to give a faint blue tint. Add sufficient water through the filter to make 1000 cc. Sterilize by Process D, page 695.

Sodium chloride, 5 Gm. per 1000 cc., may be added to this medium, if preferred.

Litmus Test Solution—

Litmus, powdered	25 Gm.
Alcohol	
Water, each, a sufficient quantity.	

Extract the litmus with three successive portions of 100 cc. each of boiling alcohol, continuing each extraction for about 1 hour. Filter, wash with alcohol, and discard the alcohol solutions. Digest the residue with about 25 cc. of cold water, filter, and discard the filtrate. Finally extract the residue with 125 cc. of boiling water, cool, and filter.

Litmus turns red with acids and blue with alkalies. The pH range is from 4.5 to 8.3. Preserve litmus T.S. in wide-mouthed containers, stoppered with loose plugs of purified cotton.

Nutrient Agar—

Agar, finely shredded or in flakes	15 Gm.
Peptone	5 Gm.
Beef Extract	3 Gm.
Water	1000 cc.

Dissolve the agar in 800 cc. of water by means of heat. Dissolve the peptone and beef extract in 200 cc. of water. Mix the two solutions. Add sufficient normal sodium hydroxide to bring the hydrogen-ion concentration to pH 7.2, or to 0.2 higher than the pH desired in the finished medium. If clarification is desired, filter the medium while hot through cotton enclosed in gauze into suitable containers. Sterilize by Process C, page 694, for 20 minutes at 15 pounds pressure (121.5°).

Sodium chloride, 5 Gm. per 1000 cc., may be added to this medium, if preferred.

Boiling or Distilling Range or Temperature

To determine the temperatures between which an official liquid may boil or the percentage of the material which distils between specified temperatures, use Method I or Method II as directed in the text. The minimum boiling point is the temperature shown by the thermometer when the first 5 drops of the liquid have been collected from the condenser. The maximum boiling point is the temperature at which the last liquid evaporates from the bottom of the flask (Dry Point) or when the proportion specified in the text has been collected.

Method I—This method is to be used with liquids for which the permissible range in boiling temperature is 5° or less.

Apparatus Required—A distilling bulb of from 50- to 60-cc. capacity to the lower part of the neck; the length of the neck is from 10 to 12 cm. and its internal diameter from 14 to 16 mm. The outlet tube, of from 10 to 12 cm. in length and from 4 to 5 mm. internal diameter, is to be attached to the neck at approximately its midpoint, forming an angle from 70° to 75° with the lower portion of the neck.

A straight glass condenser with a water jacket from 40 to 60 cm. long, the distance from the upper end of the jacket to the neck of the bulb being from 18 to 25 cm.

Provide an asbestos board 12 to 15 cm. square and 3 to 5 mm. thick and having a circular perforation, located centrally, for the reception of the bulb. The edge of the asbestos around the perforation should fit closely to the bulb when the latter is set into it. The size of the perforation should be such that when the bulb is set into it the portion of the bulb below the upper surface of the asbestos will have a capacity of from 3 to 4 cc.

Thermometer—In order to avoid the necessity for an emergent stem correction, an accurately standardized thermometer of the Anschutz type or a thermometer of Type VI or VII, page 701, may be employed. When placed in position, the top of the bulb of the thermometer is level with the center of the opening of the outlet tube When a thermometer of Type VI or VII is employed, the following correction may be made for the temperature of the emergent stem:

$$\text{Correction} = 0.00015 \times N(T - t)$$

in which N represents the number of degrees of emergent stem from the bottom of the stopper; T, the observed temperatures of distillation; and t, the temperature registered by an auxiliary thermometer whose bulb is placed midway of the emergent stem; the correction to be added to the observed readings of the main thermometer.

Procedure—Place the asbestos board on a tripod or other suitable support. Place in the distilling bulb 25 cc. of the liquid to be tested, insert the thermometer, stand the bulb in an upright position in the perforation of the asbestos board, and connect it with the condenser. Then distil the liquid by the application of heat, from a suitable source, at the rate of 4 to 5 cc. per minute, noting the temperature as soon as 5 drops of the liquid have distilled into the receiver, and when the last liquid evaporates from the bottom of the flask or when the specified percentage has distilled over. Correct the observed temperature readings for any variation in the barometric pressure from the normal (760 mm.) by allowing 0.1 degree for each 2.7 mm. of variation, adding if the pressure is lower, or subtracting if higher than 760 mm., and apply emergent stem correction when necessary.

NOTE—In order to have the entire volatile portion distil over at the prescribed

rate, it is best to make a preliminary distillation of a separate portion of 25 cc. of the liquid, during which the source of heat is regulated so that the distillation proceeds at the prescribed rate. Having thus regulated the heat, temporarily remove it. Then clean the bulb, recharge it with a fresh portion of 25 cc. of the liquid, and conduct a new distillation as described above.

Method II—This method is to be used with liquids for which the permissible range in boiling temperature exceeds 5°.

Apparatus Required—A 200-cc. distilling bulb with an outlet tube attached about midway of the neck and making an angle of from 70° to 75° with the lower portion of the neck. The length of the neck is from 10 to 12 cm. and its inside diameter is from 18 to 24 mm. The length of the outlet tube is from 10 to 12 cm. and its inside diameter is from 5 to 6 mm.

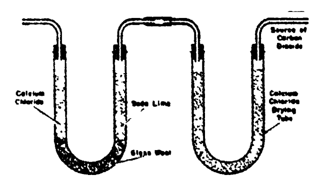
Use a straight glass condenser, a thermometer, and an asbestos board as in *Method I*. The diameter of the perforation in the asbestos board is 50 mm.

Procedure—Place the distilling bulb in an upright position in the perforation in the asbestos board and connect it with the condenser. The outlet tube is to extend from 25 to 35 mm. into the condenser beyond the connecting stopper.

Measure 100 cc. of the liquid* to be tested, using a cylinder having 1-cc. graduations. Note the temperature of the liquid, and transfer it as completely as possible to the distilling bulb Use this cylinder as the receiver for the distillate without rinsing out any of the adhering liquid. Insert the thermometer, connect the distilling bulb with the condenser as described in *Method I*, and distil by the application of heat, at the rate of from 4 to 5 cc. per minute, collecting the distillate coming over between the temperatures specified in the text. Bring the distillate to the same temperature as that at which the liquid was originally measured, and note its volume. Correct the temperature reading for barometric pressure, and if necessary, for the emergent stem of the thermometer.

Liquids which begin to distil below 80° are cooled to from 10° to 15° before measuring the 100 cc. for the test. The end of the condensing tube is fitted with an adapter bent at a suitable angle and the end of the adapter is passed through a stopper inserted into the receiving cylinder. The stopper has a small perforation to permit the exit of air. The receiving cylinder is kept immersed in ice to within 2.5 cm. of its height during the distillation.

Carbon Dioxide Absorbency of Soda Lime



Soda Lime Absorbency Test Apparatus

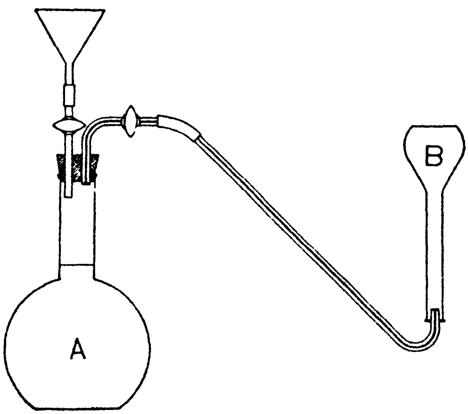
Fill the lower transverse section of a U-shaped drying tube of about 15 mm. internal diameter and 15 cm. height with loosely packed glass wool. Place in one arm of the tube approximately 5 Gm. of anhydrous calcium chloride, and accurately weigh the tube and contents. Into the other arm of the tube place from 9.5 to 10.5 Gm. of soda lime, and again weigh accurately. Stopper the open arms of the U-tube, and connect the side tube nearer the soda lime with a calcium

* For the determination of the distillation range of the cresol from *Saponated Cresol Solution* use the volume of the cresol obtained in the test and the distilling bulb prescribed in Method I.

chloride drying tube, which in turn is connected to a suitable source of supply of carbon dioxide. Pass carbon dioxide through the U-tube at a rate of 75 cc. per minute for exactly 20 minutes. Disconnect the U-tube, cool to room temperature, remove the stoppers, and weigh: the increase in weight is not less than 22 per cent of the weight of the soda lime used for the test.

Carbon Monoxide in Oxygen

Equip a 1000-cc. flask, *A*, having a long neck, with a tightly fitting, two-hole rubber stopper. Insert a straight stopcock through one hole. Into the other hole place a capillary stopcock, one arm of which is bent at a right angle, as illustrated. The end of the capillary extends 1 to 2 mm. beyond the lower surface of the stopper. The stopcocks must be capable of holding a vacuum. Indicate with a suitable marking a 50-cc. volume on the neck of the flask with the stopper inserted.



Carbon Monoxide Test Apparatus

Fill flask *A* completely with water, and invert it into a pneumatic trough. Admit the gas to be tested by displacement until the water level reaches the mark previously made on the flask, thus permitting 50 cc. of water to remain in the flask. Displace the remainder of the water with nitrogen (carbon monoxide-free), then tightly close the flask. Having placed the flask in the upright position, attach a funnel by means of rubber tubing to the straight stopcock tube.

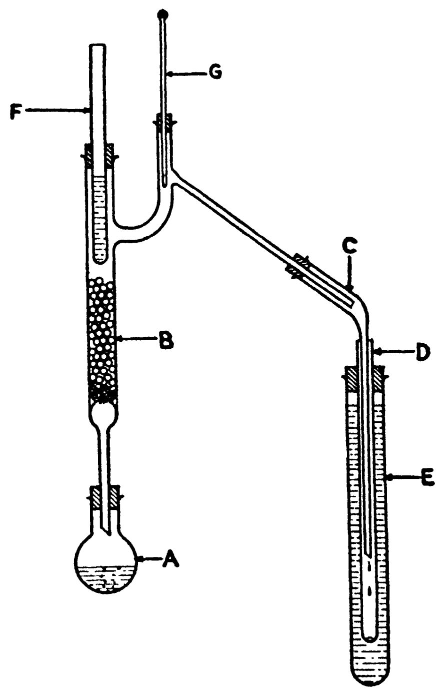
Through the funnel pass 290 cc. of freshly prepared alkaline sodium hydrosulfite T.S., avoiding the introduction of air bubbles. When the total quantity of the test solution has been added, close the stopcock, agitate the flask for 5 minutes, and then allow water to be drawn into the flask through the funnel until the normal atmospheric pressure is restored within the flask.

By means of rubber tubing connect a suitable glass capillary delivery tube previously filled with water, to the capillary stopcock. Fill a 100-cc. volumetric flask, *B*, with water, and invert it in a pneumatic trough. Place the free end of the delivery tube under the mouth of the volumetric flask. Displace the remaining gas in flask *A* by water, forcing the gas into the inverted flask *B*. The volume of gas collected does not exceed 90 cc. Displace the remaining water in flask *B* by nitrogen (carbon monoxide-free), and insert the stopper.

Add 10 cc. of water to 0.5 cc. of blood, page 748, and mix thoroughly. Immediately add 2.5 cc. of the blood dilution to flask *B*, stopper, and shake the flask frequently during 15 minutes. Add to flask *B* 40 mg. of a mixture of equal parts by weight of pyrogallol and tannic acid. Shake thoroughly, and allow the flask to stand in the dark for 15 minutes. Pour the contents of the flask into a test tube for observation: no pink coloration is observed.

Chloroform Determination

This method may be used for the determination of chloroform in mixtures with alcohol or with alcohol and water. The apparatus required consists of a 100-cc. extraction flask, *A;* a dephlegmator, *B;* an adapter, *C;* a carbon tube (Eggertz Color Comparison Tube), *D*, having a capacity of 30 cc. and graduated to 0.1 cc., and a water jacket, *E*, for the carbon tube. The dephlegmator consists of a glass tube of 25-mm. internal diameter and 275 mm. in length which is sealed at one end to a glass tube of 6-mm. internal diameter and 100 mm. in length, the end of which is ground to an angle of 45°. At a distance of 25 mm. above the joint, the larger tube is indented at four points equally spaced about its circumference, the indentations nearly meeting in the center of the tube. The top of the tube is finished with a ring. A side tube of 12-mm. internal diameter is sealed to the larger tube at a point 90 mm. below the top, and this tube is bent vertically upwards with a smooth curve so that the distance between the opposing walls of the tubes is 50 mm. and the top of the side tube 50 mm. above the top of the larger tube. A delivery tube of 6-mm. internal diameter and 230 mm. in length is sealed to the side tube about midway of its length, the delivery tube forming an angle of about 120° to the upward extension of the side tube. The top of the main tube is closed with a 1-hole cork stopper, the surface of which has been lightly charred, which carries a glass refluxing tube, *F*, of 12-mm. internal diameter and 250 mm. in length, sealed at the lower end, and extending to about 12 mm. below the entrance to the side tube, the refluxing tube being filled to about one-half its length with alcohol. A pledget of glass wool is placed upon the indentations in the main tube and the tube then filled to a height of about 125 mm. with glass beads. The open end of the side tube is closed with a lightly charred cork carrying a thermometer, *G*, graduated to 100°. The delivery tube is attached by a lightly charred cork to a bent adapter, the extension of which is bent vertically downwards and extends about two-thirds of the distance to the bottom of the carbon tube. The carbon tube is supported by means of a one-hole stopper in a test tube of about 37-mm. internal diameter and 300 mm. in length, which is to be filled with a mixture of finely crushed ice and water during the distillation.



Chloroform Determination Apparatus

Place 20 cc. of chloroform liniment in the flask, add 10 cc. of alcohol and 20 cc. of water, and connect the flask to the dephlegmator by a one-hole cork stopper, the surface of which has been lightly charred after boring. Fill the refluxing tube to about one-half its depth with alcohol. Place 5 cc. of water in the carbon tube, connect the dephlegmator with an adapter which extends to within about 25 mm. of the water in the carbon tube, and surround the carbon tube with a mixture of ice and water. The carbon tube should be lowered as necessary during the distillation to keep the end of the adapter above the liquid in the carbon tube. Heat the liquid in the flask until it boils gently, and continue the heating until no more chloroform is seen to sink through the water in the carbon tube, and the interior walls of the dephlegmator and adapter are free from globules. The temperature recorded by the thermometer should not rise above 78° during the distillation. When distillation of the chloroform is complete, fill the carbon tube to the 30-cc. mark, swirl it vigorously to dissolve any alcohol carried over with the chloroform, and then tap the carbon tube sharply on the desk to collect any globules of chloroform adhering to the walls. Finally, place the carbon tube in a bath of water at 25°, and read the volume of chloroform when that temperature has been attained.

Chromic Acid Cleansing Mixture

Sodium Dichromate	200 Gm.
Water	100 cc.
Sulfuric Acid	1500 cc.

Dissolve the sodium dichromate in the water, then add the sulfuric acid slowly and with stirring.

Clarity of Parenteral Solutions

Examination of Parenteral Solutions in Ampuls, Vials, or in Larger Containers - A suitable device for observing the clarity of parenteral solutions may be provided by placing a "gooseneck" desk lamp in front of a vertical screen. The screen, covered with black or white for the detection of light- or dark-colored particles, has a dull or "flat" finish, to reduce reflection to a minimum. The desk lamp is provided with a parabolic, hemispherical or hemispheroidal shade, preferably lined in frosted white to prevent reflection of images. The front of the reflector is tilted downward slightly to protect the observer's eyes from direct illumination. With such a lamp the source of light is a 100-watt, inside-frosted, incandescent bulb operating at rated voltage. Approximately the same intensity of illumination is given by three 15-watt fluorescent lamps. The intensity of illumination, determined with a light-meter, at a distance of 10 inches from the source, is not less than 100 and not more then 350 foot-candles.

For examination the surface of the ampul or other container of a parenteral solution shall be free from attached labels and thoroughly cleaned. Holding the container by the neck, slowly invert it to prevent the formation of fine air bubbles, and twirl it slightly to rotate the liquid therein. Then hold the container horizontally about 4 inches below the front edge of the light source and examine the contents against the white and against the black backgrounds. Preferably make the exami-

nation in subdued light or in a dark room to eliminate extraneous light from the walls of the container.

Congealing Temperature

Unless otherwise directed, place about 10 cc. of the liquid, or 10 Gm. of the melted solid to be tested in a dry test tube of about 20 mm. internal diameter, and cool in water or other suitable medium, the temperature of which is about 5° below the supposed congealing point of the liquid. Then promptly suspend the test tube through a stopper, or by some other suitable arrangement, to at least three-fourths of its length in a larger test tube or narrow bottle, and gently stir the liquid with a standardized thermometer until it begins to solidify. Congelation may frequently be induced by rubbing the inner walls of the test tube with the thermometer. Discontinue the stirring, and note the rise in temperature every 5 to 10 seconds. The highest temperature remaining constant for about 1 minute is the congealing temperature.

Consistency of Petrolatum

Determine the consistency of petrolatum by means of a penetrometer having a scale calibrated in tenths of a millimeter, and a cone constructed of stainless steel or brass, with a detachable hardened steel or stainless steel tip, the outside surface of the cone having a very smooth finish. The tip of the cone shall have an angle of 30°, the point being truncated to a diameter of 0.38 mm. ± 0.08 mm. The base of the tip shall be 8.38 mm. ± 0.13 mm. in diameter, and the length of the tip 15 mm. ± 0.25 mm. The remaining portion of the cone shall have an angle of 90°, shall be 28.2 mm. in height, and shall have a maximum diameter at the base of 65.1 mm. The total moving weight of the cone shall be 150 Gm.

The vessel containing the petrolatum shall be placed in a bath at a temperature of 25° ± 0.5° until ready for the determination.

Procedure—Test all samples of petrolatum for original consistency after melting and cooling to the temperature of the test. Bring the samples to 25° ± 0.5° before the test. If the sample is initially within 1.5° to 2° of this temperature, it may be brought to 25° by placing it in a water bath for 40 minutes; but if the initial temperature is outside of this range, place the sample in the constant-temperature bath for 1½ hours to obtain the desired temperature. If the room temperature is more than 1.5° to 2° from 25°, close the container tightly to prevent the entrance of water, and immerse the can in the bath for the required period.

In conducting the test, the surface of the sample must be cut level and very smooth with a knife, care being taken not to "work" the surface. Place the can of petrolatum on the penetrometer table, and lower the cone until the tip just touches the top surface of the sample, watching the shadow of the tip as an aid to accurate setting. Quickly release the plunger and hold it free for 5 seconds. The consistency is indicated by the total penetration as read from the scale.

The total surface area disturbed by the test will have a diameter about equal to the measured depth of penetration. In order to prevent one test from being affected by the disturbed area of a previous test or by the sides of the container, the tip must never be placed nearer the sides of the container or the edge of a previous hole than the penetration distance of that particular sample. The surface must not be smoothed over for subsequent tests. Make five such tests and report the average

of the five as the consistency of the petrolatum if the mean deviation does not exceed 3 per cent. If the mean deviation exceeds 3 per cent, report the average of 10 determinations.

Containers for Injections

Containers for injections shall be so constructed and packaged that the quality and sterility of the contents are not impaired. As it is important to examine the appearance of the contents, containers for injections are composed of clear glass not colored or clouded unless the contents are affected by light. Even in the case of the latter, enclosing the container or containers of clear glass in closed cartons, impervious to light, will protect the contents. The immediate container must be sterile before being filled unless the container and contents are subsequently to be sterilized by Process C or by other suitable effective process.

The container must be sealed or otherwise protected so as to exclude all organisms. A container of multiple doses, designed to permit the withdrawal of successive volumes on different occasions, must be closed with a suitable rubber cap or other suitable closure.

Types of Glass Containers

Glass containers for injections meet the following requirements:

Containers for injections and other U. S. P. preparations for parenteral use, other than those in oily vehicles, shall be of one of the following types:

Type I. Glass containers of any capacity, conforming to the requirements on page 631.

Type II. Glass containers of not over 100-cc. capacity, conforming to the requirements on page 631.

Type III. Glass containers of any capacity, conforming to the requirements on page 631.

Type IV. Glass containers of over 100-cc. capacity, conforming to the requirements on page 632.

Glass containers which satisfy the requirements for Type I may be used for any preparation.

When containers of Type II are directed in a monograph, containers of Type I may be used.

When containers of Type III are directed in a monograph, containers of Type I may be used in any capacity, those of Type II if the capacity is not over 100 cc., and those of Type IV if the capacity is greater than 100 cc.

When containers of Type IV are directed in a monograph, containers of Type I of the same capacity may be used.

When containers of Type II and Type III are used, they must be sterilized by dry heat prior to filling.

Containers of Type II and Type III are designed only for U. S. P. preparations that are sterilized in bulk, then filled into previously sterilized containers under aseptic conditions.

The container must be sealed or otherwise properly closed to exclude the entrance of all organisms.

Test for containers of Type I—Take a sufficient number of containers at random, not less than 6, cleanse them thoroughly with water, rinse, and dry. Crush the containers to about 25-mm. size and take from 100 to 120 Gm. of the well-mixed glass and reduce it to a powder in a suitable steel mortar. Place the powder on a No. 20 sieve nested in a No. 40 sieve, which in turn is nested in a No. 50 sieve, and sift briefly. Remove the glass on the No. 20 and No. 40 sieves, recrush in the mortar, and sift a second time. Again remove the glass on the No. 20 and No. 40 sieves, crush again, and sift for the third time. Return the glass retained on the No. 40 and No. 50 sieves to the sieve assembly and sift again for 5 minutes. A mechanical sieve shaker, page 653, may be used if desired. Spread the glass powder retained on the No. 50 sieve, which should weigh from 10 to 15 Gm., on a sheet of paper and pass a magnet through it several times to remove any particles of iron. Transfer the powder to a small basket of No. 50 brass or copper gauze and agitate the basket containing the powder in a beaker of distilled water for 1 minute and then for 30 seconds in each of 2 beakers of alcohol. At this time, the particles should be of uniform size and free from small particles or agglomerates of powder. Dry the washed sample at 140° for 20 minutes and cool in a desiccator. Place 10 Gm. of the dried glass, accurately weighed, in a resistance glass flask of about 125-cc. capacity, add 40 cc. of water which has not come in contact with copper, loosely cap the flask with a resistance glass cover, and autoclave for 30 minutes at 15 pounds steam pressure (121.5°). Cool the autoclave to atmospheric pressure within 30 minutes, then remove the flask, cool rapidly to room temperature, and titrate with fiftieth-normal sulfuric acid, using phenol red pH indicator. Perform a blank test with water from the same lot and using the same kind of flask, and make any necessary correction: not more than 0.6 cc. of fiftieth-normal sulfuric acid is consumed.

Test for containers of Type II—Take a sufficient number of containers at random, not less than 6, and rinse them six times with water. Fill each container to its rated capacity with water at 80°, which has not been in contact with copper, and which, just previous to use, has been boiled down to three-fourths of its original volume, and to which has been added subsequently 2 drops of phenolphthalein T.S. for each 100 cc. of water. Place the containers in a large beaker or other glass vessel and cover the vessel with an inverted crystallizing dish or clock glass so arranged that the condensate will fall outside the vessel, or, instead, cover each container with an inverted resistance glass beaker. Place the containers in an autoclave and heat at 15 pounds steam pressure (121.5°) for 1 hour. Cool the autoclave to atmospheric pressure within 30 minutes, remove the container, and immediately titrate 100 cc. of the water, accurately measured, and taking an equal volume from each container, with fiftieth-normal sulfuric acid: not more than 0.5 cc. of fiftieth-normal sulfuric acid is required to discharge the pink color.

Test for containers of Type III—Take at least 6 containers at random if less than 100-cc. capacity, at least 3 if more than 100- but not over 500-cc. capacity, and at least 2 if more than 500- but not over 1000-cc. capacity. Cleanse them thoroughly, rinse in water, and dry. Crush the containers to about 25-mm. size and take from 100 to 120 Gm. of the well-mixed glass. Reduce the glass to powder, as directed under the test for containers of Type I, and wash and dry the powdered glass retained on the No. 50 sieve as directed therein. Place 10 Gm. of the powdered glass, accurately weighed, in a 200-cc. Erlenmeyer flask of resistance glass, which has previously been digested with 50 cc. of fiftieth-normal sulfuric acid for 24 hours at 90°,

rinsed with water, and dried. Add to the flask 50 cc. of fiftieth-normal sulfuric acid, accurately measured, and stopper the flask with a one-hole rubber stopper. Immerse the flask in a water bath previously heated to 90°, so that the bottom of the flask is 50 mm. below the surface of the water, and maintain the temperature of the bath at 90° ± 0.5°, for 4 hours. Remove the flask, cool it quickly in running water, remove the stopper, and rinse down the inner walls of the flask with a small amount of water. Add 5 drops of methyl red T.S. and titrate with fiftieth-normal sodium hydroxide. Titrate a fresh 50-cc. portion of the same fiftieth-normal sulfuric acid to the same end-point: the difference between the two titrations corresponds to not more than 5 cc. of fiftieth-normal sulfuric acid.

Test for containers of Type IV—Take a sufficient number of containers at random, not less than 6, cleanse them thoroughly with hot water, and rinse them with water. Nearly fill the containers with water which has not come in contact with copper, invert resistance glass beakers over the openings of the containers, and autoclave them for 30 minutes at 15 pounds pressure (121.5°). Cool the autoclave to about 100° within 30 minutes and remove the containers. Transfer an accurately measured suitable quantity, but not less than 100 cc. from each container, to a resistance glass beaker, add 1 cc. of diluted sulfuric acid, evaporate the solution to a volume of 30 to 40 cc., and transfer the contents to a previously ignited, tared, platinum dish. Evaporate the solution to dryness and ignite at a dull red heat to constant weight. Perform a blank test with water from the same lot in the same manner and make any necessary correction: the total solids dissolved amount to not more than 3.5 mg. per liter of water.

NOTE—The most effective type of steel mortar used in the examination of containers of Types I and III for crushing the glass is commonly referred to as a "diamond" mortar. A suitable mortar and pestle may be made from "Oil Die" steel as follows: The mortar should have an external diameter of 75 mm. and an overall height of 60 mm., and the outside edges should be slightly rounded. The cavity in the mortar should be 35 mm. deep and have a diameter of exactly 50 mm. The angle at the bottom edge of the cavity should be turned to a radius of 0.8 mm.

The solid pestle should have an overall length of 106 mm. The head of the pestle should have a width of 49.6 mm. and a length of 45 mm. The bottom edge of the head should be turned to a radius of 0.8 mm., and the upper edge be slightly rounded. The handle end of the pestle should be 30 mm. in diameter, the junction of the handle and head be turned to a radius of 6 mm., and the top edge should be slightly rounded. No deep tool marks should be left in the cavity of the mortar or on the head of the pestle.

The mortar and the head of the pestle should be hardened by heating to 840°, quenching in oil, and drawing at 150°. The inner surface of the mortar and the surface of the head should be cleaned with emery cloth after hardening. The top 25 mm. of the handle should be left soft.

To crush the glass, place from 30 to 40 Gm. of the glass, in about 25-mm. pieces, into the mortar, insert the pestle, and strike the pestle four sharp blows with a 2-pound hammer.

To screen the crushed glass, nest together Nos. 20, 40, and 50 sieves with a sieve pan underneath, and place the sieve assembly in a mechanical sieve shaker, page 653. The No. 20 sieve is used to reduce abrasion of the No. 40 sieve. The glass remaining

on the No 20 and No 40 sieves is returned to the mortar for further crushing after all of the glass has been reduced for the first time

Screening is preferably done on a mechanical sieve shaker, page 653, in which the nested sieves may be shaken If necessary to screen by hand, place each crushing from the mortar in turn on the No 20 sieve fitted with the pan, hold the sieve in one hand while slightly inclined, and tap the side of the sieve against the palm of the other hand at the rate of about 150 times per minute for 1 minute, turning the sieve about one-sixth of a revolution after each 25 strokes, and repeat the operation with the No 40 and No 50 sieves

Suggested Types of Glass Containers for Preparations for Injection

It is suggested that the following glass container types be used for the water preparations for injection listed below

Parenteral Solution	Type of Glass
Aminophylline Injection	I
Antimony Sodium Thioglycollate Injection	I
Bismuth Potassium Tartrate Injection	I
Caffeine and Sodium Benzoate Injection	I
Calcium Gluconate Injection	I, II, or III
Carbachol Injection	I
Dextrose Injection	I, II, or IV
Dextrose and Sodium Chloride Injection	I, or IV
Digitalis Injection	I
Digitoxin Injection	I
Digoxin Injection	I
Emetine Hydrochloride Injection	I
Epinephrine Injection	I, or III
Ergonovine Maleate Injection	I
Histamine Phosphate Injection	I, or II
Insulin Injection	I, II, or III
Insulin, Protamine Zinc, Injection	I, II, or III
Iodopyracet Injection	I
Lanatoside C Injection	I
Liver Injection (Sterilized in container)	I
Liver Injection (Sterilized in bulk)	I, II, or III
Menadione Sodium Bisulfite Injection	I
Mercurophylline Injection	I
Mersalyl and Theophylline Injection	I
Methacholine Chloride Injection	I
Morphine Injection	I
Neostigmine Methylsulfate Injection	I
Nicotinamide Injection	I
Ouabain Injection	I
Papaverine Hydrochloride Injection	I
Parathyroid Injection	I, or III
Penicillin Injection	I

Parenteral Solution	Type of Glass
Phenolsulfonphthalein Injection.	I
Picrotoxin Injection.	I, or III
Posterior Pituitary Injection.	I
Quinine and Urethane Injection	I
Riboflavin Injection	I
Ringer's Solution..	I, or IV
Ringer's Solution, Lactated.	I, or IV
Sodium Ascorbate Injection	I, or II
Sodium Chloride Solution, Isotonic	I, or IV
Sodium Citrate Solution, Anticoagulant	I, or IV
Sodium Citrate Solution, Anticoagulant, Acid, Dextrose	I, or IV
Sodium Lactate Injection.	I, or IV
Sodium Morrhuate Injection	I
Sulfobromophthalein Sodium Injection	I
Thiamine Hydrochloride Injection	I
Water for Injection	I, or IV

Closures for the Containers

Caps or stoppers used for closing containers are to be made from good quality material. They are to be cleansed by boiling in several changes of water and then rinsed in the water for injection, or by other suitable processes, placed in covered wide-mouth containers, and sterilized, preferably by Process C. Large rubber stoppers are to be individually wrapped before sterilization, and must be long enough to be inserted and removed without contaminating the lip of the container The sterilized wrapper of the rubber stopper or other suitable sterilized cover may be employed as a cap. Non-absorbent cotton stoppers, if used to close extemporaneously prepared injections, should be wrapped in layers of gauze and capped with suitable metallic foil or stout paper.

Containers, Standards for Light Transmission

Apparatus—Several makes of apparatus of suitable sensitivity and accuracy are available. Among these are the Coleman Spectrophotometer, the General Electric Recording Spectrophotometer, and the Cenco-Sheard Spectrophotelometer. Other instruments of equivalent accuracy may be used.

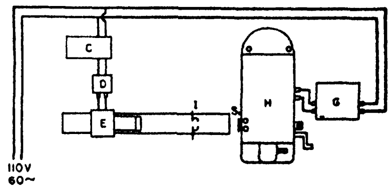
The description given below applies to the Cenco-Sheard instrument; the essential features, or their equivalents, may be found in other instruments. Detailed directions for their operation are furnished by the manufacturer.

The optical system of the photo-electric spectrophotelometer (H) is mounted within a dust-proof metal housing. It consists of an entrance slit (S) from which light is directed with a mirror to a concave diffraction grating, an exit slit, an absorption cell carriage, and a photocell.

A crank on the right side of the housing operates a mechanism which rotates and shifts the grating, causing the first order spectrum to traverse the slit, and keeping the portion of the spectrum falling on the slit in focus. A revolution counter located above the crank registers the wave length of the light to the nearest millimicron at the center of the slit. An eyepiece with crosshair and reflecting prism is provided

on top of the housing for visual scanning of the spectrum. It is introduced into the light path in front of the exit slit by pushing it downward in the mounting tube. In this position, the light seen at the crosshair is of the wave length indicated by the revolution counter. The absorption cell carriage, made to carry two cells, is located between the exit slit and the photocell.

A galvanometer (G) of high sensitivity is required to indicate the photocell current. One visual spectrum light source (E) with transformer (D), one high pressure mercury arc with transformer (for measurements down to 3340 Å), one constant voltage transformer (C), one quartz condensing lens, two filters, one iris diaphragm, and a bench support are necessary accessories. A schematic diagram of the spectrophotometer is given in the illustration.



Schematic Diagram of Photo-electric Spectrophotometer with Light Source and Transformers

Preparation of Sample—If the container material is homogeneous throughout its thickness with regard to transmission of light, the samples should be prepared approximately 2 mm. in thickness with plane polished parallel surfaces. The sample size should be that accommodated by the particular instrument to be used for the measurement. If the surface of the container material has been treated in order to affect its light transmission properties, the efficacy of this treatment shall not be impaired in the preparation of the sample. In no case shall the sample be of more than 2 mm. in thickness, unless the material is homogeneous in color throughout its thickness.

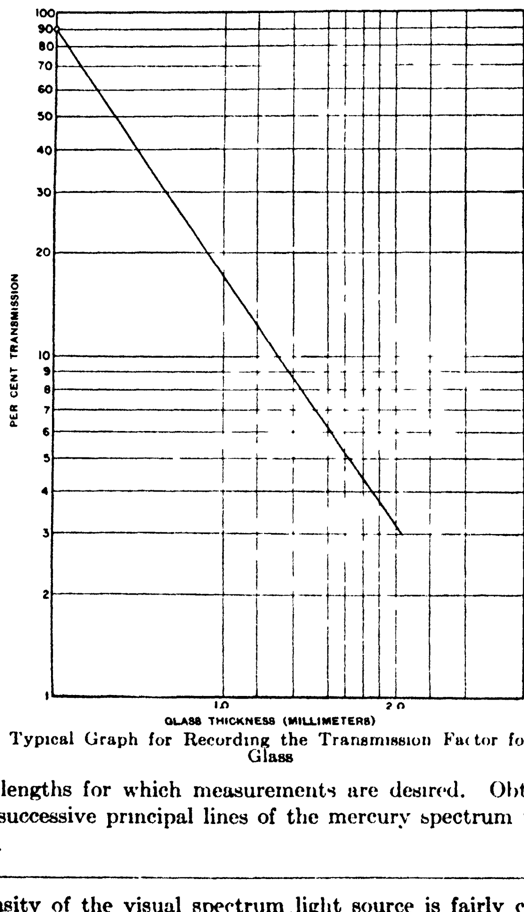
Measure the thickness of the test specimen to an accuracy of 0.01 mm. Clean the surfaces of the glass thoroughly, and be careful when placing the sample in the instrument to see that no fingerprints are left on the surfaces through which light must pass. Place the test specimen in the right-hand compartment of the absorption cell carriage so that it is normal to, and covers, the opening in the compartment. Leave the left-hand compartment empty.

Procedure—Set up the visual spectrum light source (ribbon filament lamp) for measurements in the range from 4100 Å to 7500 Å (see spectrophotometric illustration). Carefully adjust the lamp bulb so that the center of the filament is on the axis of the optical system. Focus the light so that the image of the filament just covers the slit. Adjust the entrance slit to a width of 1.5 mm., and insert the 100 Å exit slit. If the glass being tested has a very low transmission factor, wider slits must be used. However, if the glass contains narrow absorption bands, both slits must be made narrow accordingly.

Set the wave length indicator to 420 by turning the crank in a clockwise direction. If the indicator is turned past this point, it must be reset after the crank has been turned four or five revolutions in a counter-clockwise direction. Place the blank compartment in the light path and note the deflection (I_0) of the galvanometer. Adjust the iris diaphragm to bring the galvanometer deflection between 80 and 100. Record this reading as shown on the typical data sheet, page 638. Immediately move the compartment containing the test sample into the light path and record the deflection (I). The ratio I/I_0 is the transmission factor of the glass for the

wave length shown on the indicator. Make measurements at successive intervals of 200 Å. Insert a red filter (Cenco No. 87308-B610) in the filter holder in front of the entrance slit for all measurements above 6500 Å. No filter is needed for measurements between 4100 Å and 6500 Å. In some instances, narrow absorption bands may be encountered, in which cases more frequent measurements are necessary.*

To make measurements below 4100 Å, set up the mercury arc light, using the quartz condensing lens to focus the image of the light source on the slit. Insert a blue filter (Cenco No. 87308-335) in the filter holder. Set the indicator on the wave length of a principal line in the mercury spectrum, which falls near the lower



Typical Graph for Recording the Transmission Factor for Glass

limit of wave lengths for which measurements are desired. Obtain transmission factors at the successive principal lines of the mercury spectrum up to 4050 Å, as outlined above.

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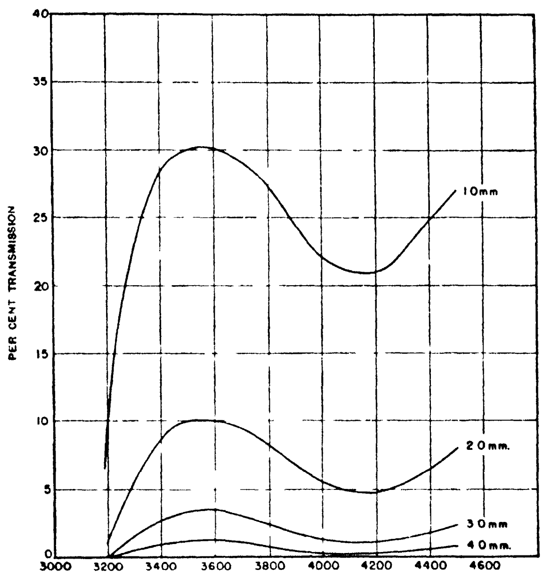
* The intensity of the visual spectrum light source is fairly constant over the range in which it is used up to about 6800 Å.

Therefore, to detect absorption bands in the visible region, place the test sample in the light path, and traverse the range of wave lengths over which measurements are to be made. Any sudden change in the deflection (*I*) of the galvanometer will indicate an absorption band at the wave length where the sudden change in deflection occurred.

In order to compare the transmission values of two glasses, the transmission factors must be obtained on the basis of a common glass thickness, and curves plotted of per cent transmission against wave length. A thickness of 2.0 mm. is taken as the basis of comparison. It is quite difficult to polish all of the samples to be tested to exactly the same thickness; therefore, the following graphical method of converting the transmission factor of a glass from one thickness to the factor for another thickness is suggested.

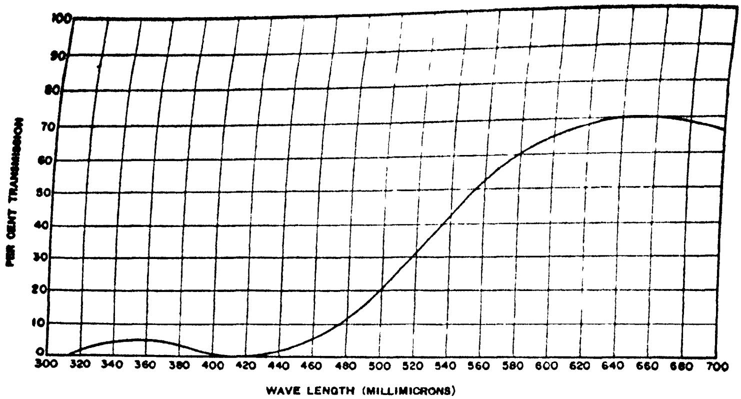
Prepare a chart on a sheet of 2-cycle, semi-logarithmic paper (Keuffel and Esser, No. 359-63; see illustrations of typical graphs for recording transmission factors) by laying off any convenient scale on the equal parts side to include the thickness of the sample tested, and the thickness for which transmission factors are desired. Draw lines on the graph to represent each of these thicknesses.



Spectral Transmission of Amber Glass for Different Thicknesses from 1.0 Mm to 4.0 Mm

Mark off the logarithmic scale in per cent, as indicated. This scale represents the amount of light transmitted by the glass after correction for reflection losses, which amount to about 4 per cent of the incident light on each surface. Since the transmission factors are not corrected for reflection losses, 92 per cent must be taken as the maximum per cent transmission, or as a basis for the graphical calculation.

Draw a straight line through the 92 per cent point at zero thickness, and any transmission factor for a glass at its measured thickness, to obtain the correct transmission factor of this glass at any other thickness. On the graph, a transmission of 5.3 per cent at 1.7 mm. glass thickness is converted to 3.2 per cent transmission for a thickness of 2.0 mm.



Characteristic Spectral Transmission Curve of an Amber Glass

Typical Data Sheets—

Sheet I—Following are a typical data sheet and transmission curve for an amber glass:

Wave Length, mμ	I_0	I	Transmission Factor T_1 = 1.7 Mm.	Transmission Factor T_2 = 2.0 Mm.
313		0	0	0
334	6.6	0.40	0.061	0.037
365	100	8.3	0.083	0.055
385	20.0	1.06	0.053	0.032
405	100	3.4	0.034	0.019
420	95.2	3.05	0.032	0.018
440	90.0	4.95	0.055	0.032
460	86.7	8.3	0.096	0.065
480	89.2	14.4	0.162	0.120
500	92.3	24.0	0.260	0.210
520	96.5	34.9	0.362	0.310
540	87.2	41.8	0.480	0.432
560	98.0	55.6	0.568	0.528
580	94.0	59.4	0.632	0.595
600	88.5	60.5	0.684	0.643
620	91.5	64.4	0.703	0.672
640	89.2	64.2	0.719	0.689
660	81.0	58.3	0.719	0.689
680	37.2	26.5	0.712	0.682
700	15.0	10.6	0.705	0.674

Measurements in the ultra-violet were made at the principal lines of mercury.

Sheet II—Transmissions at various wave lengths between 2900 and 4500 Å for various thicknesses of an amber glass when maximum transmission in 2.0-mm. thickness is 10 per cent. A typical glass was chosen for the "standard" data. Transmissions include loss by reflection.

Wave Length, Å	(Standard)			
	1.0 Mm.	2.0 Mm.	3.0 Mm.	4.0 Mm.
2900	?	0	0	0
3000	?	0	0	0
3100	?	0	0	0
3200	11.0	1.3	0.15	0.02
3300	23.4	6.0	1.54	0.39
3400	28.8	9 0	2.80	0.87
3500	30.1	10.0	3.30	1.10
3600	30.1	10.0	3.30	1.10
3700	29.0	9.2	2.90	0.92
3800	27.0	8.0	2.35	0.69
3900	24.0	6.5	1.70	0.45
4000	22.1	5.4	1.30	0.31
4100	21.0	4.8	1.10	0.25
4200	21.0	4.8	1.10	0.25
4300	22.6	5.6	1.35	0.34
4400	25.0	6.8	1.75	0.46
4500	27.0	8.0	2.40	0.70

Diameter of Sutures

The gage for determining the diameter of sutures shall be of the dead-weight type, equipped with a dial graduated to read directly to 0.001 inch (0.0254 mm.). The table or anvil of the gage shall be about 2 inches in diameter. The presser foot shall be circular with a diameter of 0.5 inch ± 0.0005 inch (12.7 mm. ± 0.02 mm.). The presser foot and moving parts connected therewith shall be weighted so as to apply a total load of 7.4 oz. ± 0.1 oz. (210 Gm. ± 3 Gm.) to the specimen. The presser foot and anvil surfaces shall be plane to within 0.0002 inch and parallel to each other to within 0.0002 inch.

Surgical Gut—Determine the diameter of surgical gut immediately after removal from the tube and without stretching. Lay the strand across the anvil in such a position as to cross the center of the anvil and presser foot, and lower the foot until its entire weight rests upon the suture. Determine the diameter of each strand at three quarterly points of its length. At least 2 of the measurements of each of not less than 10 strands from any lot of 12 tubes shall conform to the required diameter for the size indicated on the label, and at least one measurement of each of the remaining strands shall conform to the requirement. In no case shall any measurement vary more than the required diameter of the size next above or below.

Surgical Silk—These directions apply also to **Surgical Sutures,** which, if of organic material, must be conditioned in the same manner. The diameter of surgical silk is determined after the silk has been exposed, for at least 4 hours, to an atmosphere having a relative humidity of 65 per cent ± 2 per cent, and a temperature of 21° ± 1.1° (70° F. ± 2° F.). The diameter of sterile surgical silk, if packaged dry, is to be determined after conditioning as directed above. When sterile surgical silk has been packaged in a tubing fluid, its diameter is to be determined immediately after removal from the fluid, without preliminary drying or conditioning.

Attach one end of the strand of silk to a fixed clamp and lay the strand across the anvil in such a position as to cross the center; while having the strand of silk and the surface of the anvil in the same plane, pass the free end of the strand around a cylinder

or pulley, and attach to the free end a weight of approximately one-fourth the required minimum tensile strength of the strand, taking care not to permit the strand, if of twisted silk, to untwist. Determine the diameter at the designated points on the strand, and calculate the average diameter likewise as directed. The required tension may be applied to the strand in other fashion, provided the strand rests flatly across the anvil of the gage.

When determining the diameter of braided silk, if the strand is of rectangular cross section, measure the diameter between opposite flat sides of the strand.

Digitoxin Colorimetric Controls

Method I

Prepare a standard digitoxin graph from U. S. P. Digitoxin Reference Standard as follows: Accurately weigh 10 mg. of U. S. P. Digitoxin Reference Standard, previously dried at 100° for 1 hour, and dissolve it in sufficient methanol to make exactly 100 cc. To 1.0-, 3.0-, 5.0-, 7.0-, and 10.0-cc. portions of this solution, accurately measured and representing 0.1, 0.3, 0.5, 0.7, and 1.0 mg. of digitoxin, add sufficient methanol to make exactly 10 cc., and mix well. Then, to each solution add exactly 10 cc. of freshly prepared trinitrophenol reagent. [The reagent is made as follows: Dissolve 2 Gm. of trinitrophenol in sufficient methanol to make 50 cc., add 5 cc. of sodium hydroxide solution (1 in 10) and sufficient water to make 100 cc.] Mix well, and allow to stand for exactly 30 minutes. Determine the per cent of light transmission of each solution in a suitable photoelectric colorimeter, with an absorption cell having a light path of 50 ± 1 mm., and with a green filter having a maximum transmission at about 525 millimicrons, and plot the per cent of light transmission on the ordinate scale against the corresponding digitoxin concentration on the abscissa scale. A blank composed of a mixture of equal volumes of the methanol and the trinitrophenol reagent is taken as 100 per cent transmission.

Digitoxin Injection—Evaporate an accurately measured volume of the injection obtained in the *Determination of Volume of Injection in Containers*, page 665, equivalent to about 2 mg. of digitoxin, to about one-third of its original volume, and add methanol to make exactly 100 cc. To a suitable volume, accurately measured, add an exactly equal volume of freshly prepared trinitrophenol reagent, mix well, allow to stand for exactly 30 minutes, and determine the per cent of light transmission, using the same photoelectric colorimeter, at the same wave length, and with the same filter used in preparing the standard digitoxin graph. From the per cent of transmission calculate the weight of digitoxin by means of the standard digitoxin graph.

Digitoxin Tablets—Weigh a counted number of not less than 20 digitoxin tablets and reduce them to a fine powder without appreciable loss. Accurately weigh a portion of the powder, equivalent to about 2 mg. of digitoxin, in a hard-glass, glass-stoppered centrifuge tube, add exactly 50 cc. of methanol, and shake the mixture continuously for 30 minutes in a mechanical shaker, and then centrifuge. To a suitable volume of the supernatant liquid, accurately measured, add an exactly equal volume of freshly prepared trinitrophenol reagent, mix well, allow to stand for exactly 30 minutes, and determine the per cent of light transmission, using the same photoelectric colorimeter, at the same wave length, and with the same filter used in preparing the standard digitoxin graph. From the per cent of light transmission calculate the weight of digitoxin by means of the standard digitoxin graph.

Method II

Prepare a standard digitoxin graph from U. S. P. Digitoxin Reference Standard as follows: Accurately weigh 10 mg. of U. S. P. Digitoxin Reference Standard, previously dried at 100° for 1 hour, and dissolve it in sufficient alcohol to make 100 cc. Transfer exactly 0.20-, 0.50-, 1.0-, 1.5- and 2.0-cc. portions of this solution to 10-cc. absorption tubes, evaporate to dryness, and dry at 100° for 1 hour. To each tube add 3.0 cc. of glacial acetic acid, 0.10 cc. of a 5 per cent solution of ferric chloride, and 0.25 cc. of sulfuric acid, mix thoroughly, and allow to stand for 45 minutes protected from air and from direct sunlight. Determine the per cent of light transmission of each solution in a suitable photoelectric colorimeter with a filter having a maximum transmission at about 500 to 570 millimicrons, and plot the per cent of light transmission on the ordinate scale against the corresponding digitoxin concentration on the abscissa scale. A blank composed of a mixture of exactly the same volumes of the acetic acid, the ferric chloride solution, and the sulfuric acid as used in the test is taken as 100 per cent transmission.

Digitoxin Injection Dilute an accurately measured volume of the injection obtained in the *Determination of the Volume of Injection in Containers*, page 665, equivalent to about 2 mg. of digitoxin, with sufficient alcohol to make exactly 100 cc. Transfer a suitable volume, accurately measured, to an absorption tube, evaporate to dryness, and dry at 100° for 1 hour. Add 3 cc. of glacial acetic acid, 0.10 cc. of a 5 per cent solution of ferric chloride, and 0.25 cc. of sulfuric acid, mix thoroughly, allow to stand for 45 minutes protected from air and from direct sunlight, and determine the per cent of light transmission, using the same photoelectric colorimeter, at the same wave length, and with the same filter used in preparing the standard digitoxin graph. From the per cent of light transmission calculate the weight of digitoxin by means of the standard digitoxin graph.

If glycerin is present in the injection, add a comparable amount of glycerin to the solution prepared for making the standard digitoxin graph.

Digitoxin Tablets—Weigh a counted number of not less than 20 digitoxin tablets, and reduce them to a fine powder without appreciable loss. Accurately weigh a portion of the powder, equivalent to about 2 mg. of digitoxin, in a hard-glass, glass-stoppered, centrifuge tube. Add exactly 50 cc. of chloroform, shake the mixture continuously for 2 hours in a mechanical shaker, centrifuge, and collect the supernatant liquid. Repeat the extraction with 40 cc. of chloroform, mix the two extracts thoroughly, add sufficient chloroform to make 100 cc., and mix well. Place a suitable volume of the solution, accurately measured, in an absorption tube, and proceed as directed in the paragraph *Digitoxin Injection* above, beginning with the words "evaporate to dryness."

Dithizone Test for Lead

All reagents used in this test should be as lead-free as obtainable. All glassware should be well rinsed with warm dilute nitric acid (1 in 2), followed by water.

Reagents:

Reagent Stronger Ammonia Water See page 735.

Ammonium Citrate Solution Dissolve 40 Gm. of citric acid in 90 cc. of water. Add 2 or 3 drops of phenol red T.S., then cautiously add reagent stronger ammonia

water until the solution acquires a reddish color. Remove any lead that may be present by extracting the solution with 20-cc. portions of *Dithizone Extraction Solution*, page 642, until the Dithizone Solution retains its orange-green color.

Potassium Cyanide Solution—Dissolve 50 Gm. of potassium cyanide in sufficient water to make 100 cc. Remove the lead from this solution by extraction with successive portions of *Dithizone Extraction Solution*, page 642, as described under *Ammonium Citrate Solution* above, then extract any dithizone remaining in the cyanide solution by shaking with chloroform. Finally dilute the cyanide solution with sufficient water so that each 100 cc. will contain 10 Gm. of potassium cyanide.

Ammonia-cyanide Solution—Dissolve 2 Gm. of potassium cyanide in 15 cc. of reagent stronger ammonia water and dilute with water to 100 cc.

Hydroxylamine Hydrochloride Solution—Dissolve 20 Gm. of hydroxylamine hydrochloride in sufficient water to make approximately 65 cc. Transfer to a separator, add a few drops of thymol blue pH indicator, then add reagent stronger ammonia water until the solution assumes a yellow color. Add 10 cc. of a 4 per cent solution of sodium diethyl dithiocarbamate, mix well, and allow to stand for 5 minutes. Extract this solution with successive 10- to 15-cc. portions of chloroform until a 5-cc. portion of the chloroform extract does not assume a yellow color when shaken with a dilute cupric sulfate solution. Add diluted hydrochloric acid until the solution is pink, and then dilute with sufficient water to make 100 cc.

Nitric Acid 1 per cent—Dilute 10 cc. of nitric acid with sufficient water to make 1000 cc.

Dithizone Extraction Solution—Dissolve 30 mg. of dithizone in 1000 cc. of chloroform, and add 5 cc. of alcohol. Store the solution in a refrigerator.

Before use shake a suitable volume of the dithizone extraction solution with about half its volume of 1 per cent nitric acid.

Standard Dithizone Solution—Dissolve 10 mg. of dithizone in 1000 cc. of chloroform. Keep the solution in a glass-stoppered, lead-free bottle, suitably wrapped to protect it from light, and store in a refrigerator.

Lead Solution—Dilute exactly 10 cc. of *Standard Lead Solution*, page 657 (containing 10 micrograms of lead per cc.), with sufficient 1 per cent nitric acid to make 100 cc. This solution contains 1 microgram of lead per cc.

Procedure:

Transfer the volume of the prepared sample directed in the monograph to a separator, and, unless otherwise directed in the monograph, add 6 cc. of *Ammonium Citrate Solution*, 2 cc. of *Potassium Cyanide Solution* and 2 cc. of *Hydroxylamine Hydrochloride Solution.* (For the determination of lead in iron salts use 10 cc. of the *Ammonium Citrate Solution.*) Add 2 drops of phenol red T.S. and make the solution just alkaline (red color) by the addition of reagent stronger ammonia water. Immediately extract the solution with 5-cc. portions of the *Dithizone Extraction Solution*, draining off each extract into another separatory funnel, until the dithizone solution retains its green color. Shake the combined chloroform extract for 30 seconds with 20 cc. of the 1 per cent nitric acid and discard the chloroform layer. Add to the acid solution exactly 5 cc. of *Standard Dithizone Solution* and 4 cc. of *Ammonia-cyanide Solution*, and shake for 30 seconds: the color of the chloroform layer is of no deeper shade of violet than that of a control made with a volume of the *Standard Lead Solution* equivalent to the amount of lead permitted in the sample

under examination, and the same quantities of the same reagents and in the same manner as the test with the sample.

Emulsions

In preparing U. S. P. emulsions, methods of emulsification other than those described in the several monographs may be used, and the quantity of acacia may be reduced, or it may be replaced in whole or in part with gelatin, tragacanth, agar, or mixtures of these.

Gelatin meeting U. S. P. specifications but particularly designed for the preparation of emulsions is available in two types, known as pharmagel A and pharmagel B, each of which is used under different circumstances.

Pharmagel A is prepared from acid-treated precursors, and is used without other emulsifying agents and at a pH of about 3.2. It is usually to be preferred if other emulsifying agents are not to be used also. For the extemporaneous preparation of emulsions using pharmagel A the following procedure is recommended:

Gelatin (Pharmagel A)	8.0 Gm.
Tartaric Acid	0.6 Gm.
Flavor as desired	
Alcohol	60 cc.
Oil	500 cc.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Add the Pharmagel A and the tartaric acid to about 300 cc. of distilled water, allow to stand a few minutes, then heat until the gelatin is dissolved. Raise the temperature to about 98° and maintain this temperature for about 20 minutes. Cool to 50°, add the flavor, the alcohol, and sufficient distilled water to make 500 cc. Add the oil, agitate the mixture thoroughly, and pass it through a homogenizer or a colloid mill, several times, until the oil is completely and uniformly dispersed. This emulsion cannot be prepared by trituration or by the usual stirring devices.

Pharmagel B is prepared from alkali-treated precursors, and is used with or without other emulsifying agents, and at a pH of about 8.0. For 1000 cc. of an emulsion containing 50 per cent of oil, a mixture of 5 Gm. of pharmagel B and 2.5 Gm. of sodium bicarbonate should be used, sufficient tragacanth or agar being added to provide the required viscosity. For further information on the use of pharmagel B, the pharmacist is referred to the literature.

Extracts

Extracts are concentrated preparations of vegetable or animal drugs obtained by removing the active constituents of the respective drugs with suitable menstrua, evaporating all or nearly all of the solvent and adjusting the residual masses or powders to the prescribed standards.

Extracts are made in three forms: Semi-liquids or those of syrupy consistency; plastic masses, known as *pilular or solid extracts;* and dry powders, known as *powdered*

extracts. Pilular extracts and powdered extracts of any one drug are interchangeable medicinally, but each has its pharmaceutical advantages.

In the manufacture of most extracts, the drugs are extracted by the process of percolation. The rate of flow of percolates, directed under the several monographs, is defined on page 654. The entire percolates are concentrated by distillation under reduced pressure, with a few exceptions, in order to subject the drug principles to as little heat as possible. If the active principles of a drug are damaged by high temperatures or by prolonged heating, the temperature at which its percolate is concentrated is not to exceed 60° at any stage.

Diluents—Extracts which must be adjusted to prescribed standards may need diluents for that purpose. While in this Pharmacopœia liquid glucose is directed as the diluent for pilular extracts, and starch dried at 100° for powdered extracts, the following additional diluents are permitted: malt extract for pilular extracts, and for powdered extracts, sucrose, lactose, powdered glycyrrhiza, magnesium carbonate, magnesium oxide, calcium phosphate, the finely powdered marc remaining after the extraction of the drug, or other inert, non-toxic diluents. Magnesium carbonate and magnesium oxide should not be used in powdered extracts of belladonna and stramonium. The diluent for a powdered extract may be colored with chlorophyll or caramel to produce a color corresponding to the normal color of the extract, but an excess of coloring agent must not be added.

Defatting extracts Powdered extracts which are made from drugs that contain a material proportion of inactive oily or fatty matter should have this removed in order to obtain a satisfactory product. Any suitable method for defatting either the drug or the extract may be employed. The following methods for treating the extract are recommended:

Method I—Prepare the extract in the regular manner to the point where, before final adjustment, it is dried with a portion of starch. To this dry powder add petroleum benzin (about 300 cc. of benzin for each 100 Gm. of drug extracted) and stir well several times during 2 hours. Allow to settle and decant or drain off the excess of liquid. Mix the residue with another (smaller) portion of petroleum benzin, stir thoroughly, and separate the excess of benzin. Repeat the washing with a third portion of petroleum benzin, then drain the powder, and dry it thoroughly at a temperature not exceeding 70°. Weigh the dried powder, and adjust it to the prescribed quantity or strength.

Method II—To the soft extract obtained by the evaporation of the percolate, add slightly acidulated water at a temperature of about 80° in the proportion of about 80 cc. of acidulated water to each 100 Gm. of soft extract or crude drug represented. Stir the mixture thoroughly, and allow it to stand until almost cold. Remove and discard any oily or fatty matter which has risen, then separate and retain the water layer. Treat the undissolved extract residue twice as just described, combine and evaporate the water liquids to a soft extract at a temperature not exceeding 70°. Mix the soft extract thus obtained with a portion of starch, dry the mixture at a temperature not exceeding 70°, and complete the extract in the usual way.

The acidulated water suggested above should contain about 0.05 per cent of HCl or about 0.2 per cent of tartaric acid.

Packaging and storage—Preserve Extracts in tight, light-resistant containers, preferably at a temperature not above 30°.

Fats and Fatty Oils

Preparation of Sample—If a sample of oil shows turbidity owing to separated stearin, warm the container in a bath of water at 50° until the turbidity has disappeared and the oil is clear. Thoroughly mix the clarified oil before weighing the samples. If the oil does not become clear on warming, filter it through dry filter paper in a funnel contained in a hot water jacket. Weigh at one time as many portions as are needed for the various determinations, using preferably a bottle having a pipette dropper, or a weighing burette. Keep the sample melted, if solid at room temperature, until the desired samples are withdrawn.

Specific Gravity—The specific gravity of a fat or oil shall be determined at 25°, except when the substance is a solid at that temperature. In this case the specific gravity shall be determined at the temperature directed in the respective monograph and referred to water at 25°.

Clean a pycnometer (use a Sprengel or other suitable pycnometer with a well-fitted capillary stopper) by filling it with chromic acid cleansing mixture, page 628, and allowing it to stand for at least 4 hours. Empty the pycnometer, and rinse it thoroughly with water; then fill it with recently boiled water previously cooled to about 20°, and place in a constant temperature bath at 25°. At the end of 30 minutes adjust the level of the water to the proper point on the pycnometer; insert the perforated cap or stopper; remove from the bath, wipe dry with a clean cloth, free from lint; and, after allowing to stand for 30 minutes, weigh. Empty the pycnometer, rinse several times with alcohol and then with ether, allow it to become perfectly dry, remove any ether vapor, and weigh. Ascertain the weight of the contained water at 25° by subtracting the weight of the pycnometer from its weight when full.

Fill the clean, dry pycnometer with the oil at a temperature below that at which the determination is to be made: place it in a constant temperature bath at the specified temperature for 30 minutes; adjust the level of the oil to the proper point on the pycnometer; insert the cap or stopper, wipe dry; allow to stand for 30 minutes; and weigh. Subtract the weight of the empty pycnometer from its weight when filled with oil, and divide the difference by the weight of water contained at 25°. The quotient is the specific gravity at the temperature of observation, referred to water at 25°.

Index of Refraction—The index of refraction shall be determined by means of the Abbé refractometer. The determination shall be made at the temperature specified for the oil, maintaining the temperature by circulating water at the proper temperature through the heating jackets surrounding the prisms of the refractometer.

Melting Temperature—Determine the melting temperature as directed for substances of Class II, page 668.

Solidification Temperature of Fatty Acids. (Frequently referred to as the "*titer.*")

Preparation of the Fatty Acids—Heat 75 cc. of glycerin-potassium hydroxide solution (made by dissolving 25 Gm. of potassium hydroxide in 100 cc. of glycerin) to 150° in an 800-cc. beaker, and add 50 cc. of the clarified fat, melted if necessary. Heat the mixture for 15 minutes with frequent stirring, but do not allow the temperature to rise above 150°. When saponification is complete, the mixture is homogeneous, with no particles clinging to the beaker at the meniscus. Pour the

contents of the beaker into 500 cc. of nearly boiling water in an 800-cc. beaker or casserole, add slowly 50 cc. of dilute sulfuric acid (made by adding 1 volume of sulfuric acid to 3 volumes of water), and heat the solution, with frequent stirring, until the fatty acids separate cleanly as a transparent layer. Wash the acids with boiling water until free from sulfuric acid, collect them in a small beaker, and place on a boiling water bath or steam bath until the water has settled and the fatty acids are clear, filter into a dry beaker while hot, and dry for 20 minutes at 100°.

Test for Complete Saponification—Place 3 cc. of the dry acids in a test tube and add 15 cc. of alcohol. Heat the solution to boiling and add an equal volume of ammonia T.S. A clear solution should result.

Determination of the Solidification Temperature—Cool the dry, filtered acids to from 15 to 20 degrees above the expected reading, and transfer to a glass tube 25 mm. in diameter and 100 mm. in length, the glass being 1 mm. in thickness. By means of a perforated cork fasten the tube in a wide-mouth bottle of clear glass, approximately 70 mm. in diameter and 150 mm. in height. Suspend a thermometer of Type V, page 701, in the melted acids so that it will serve as a stirrer, cool if necessary, and stir the mass slowly until the mercury remains stationary for 30 seconds. Then allow the thermometer to hang quietly, with the bulb in the center of the acids, and observe the rise of the mercury column. The highest point to which it rises is the Solidification Temperature of the fatty acids.

Acid Value (*Free Fatty Acids*).

The Acid Value is the number of milligrams of potassium hydroxide required to neutralize the free acids in 1 Gm. of substance. The acidity may also be expressed as the number of cubic centimeters of tenth-normal alkali required to neutralize the free acid in 10 Gm. of substance. The acidity of fats, oils, waxes, fatty acids, resins, and balsams is determined by dissolving a weighed quantity of the sample in alcohol or a mixture of equal volumes of alcohol and ether (either solvent having been neutralized with dilute sodium hydroxide to a phenolphthalein end-point), adding phenolphthalein T.S. as the indicator, and titrating with standard sodium hydroxide solution to a pink color that persists after shaking the mixture for 30 seconds.

The method: Unless otherwise directed, dissolve about 10 Gm. of the substance, accurately weighed, in 50 cc. of a mixture of equal volumes of alcohol and ether (which has been neutralized to phenolphthalein with tenth-normal sodium hydroxide) contained in a flask. If the sample does not dissolve in the cold solvent, connect the flask with a reflux condenser and warm slowly, with frequent shaking, until the sample has dissolved. Add 1 cc. of phenolphthalein T.S. and titrate with tenth-normal sodium hydroxide until the solution remains faintly pink after shaking for 30 seconds. Calculate either the *Acid Value* or the volume of tenth-normal alkali required to neutralize exactly 10 Gm. of sample, as directed.

If the oil has been saturated with carbon dioxide for the purpose of preservation, the solution in alcohol-ether must be boiled gently for 10 minutes under the reflux condenser before titration. The oil may also be freed from carbon dioxide by exposing it in a shallow dish in a vacuum desiccator for 24 hours before weighing the samples.

Ester Value.

The Ester Value is the number of milligrams of potassium hydroxide required to saponify the esters in 1 Gm. of fatty or volatile oil, fat, wax, resin, balsam, or similar organic substance. If the Saponification Value and the Acid Value have been determined, the difference between these two represents the Ester Value.

To determine the Ester Value directly, proceed as follows: Shake from 1.5 to 2 Gm. of the substance, accurately weighed in a 200- to 250-cc. tared flask, with from 20 to 30 cc. of neutralized alcohol, add 1 cc. of phenolphthalein T.S., and titrate with half-normal alcoholic potassium hydroxide until the free acid is neutralized. Add exactly 25 cc. of half-normal alcoholic potassium hydroxide, and proceed as directed under *Saponification Value*, beginning with "Insert in the neck of the flask" and omitting the further addition of phenolphthalein T.S. The difference between the number of cc. of half-normal hydrochloric acid consumed in the actual test and in the blank, multiplied by 28.05 and divided by the weight in Grams of the sample taken, is the Ester Value.

Iodine Value (*Hanus method*).

The Iodine Value of a fat or oil represents the number of grams of iodine absorbed, under the prescribed conditions, by 100 Gm. of the substance. It is determined as follows: Introduce about 800 mg. of a solid fat or about 250 mg.* of an oil, accurately weighed, into a glass-stoppered flask or bottle of 250-cc. capacity, dissolve it in 10 cc. of choroform, add 25 cc. of iodobromide T.S., accurately measured from a burette or pipette, stopper the vessel securely, and allow it to stand for 30 minutes† protected from light. Then add, in the order named, 30 cc. of potassium iodide T.S. and 100 cc. of water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, shaking thoroughly after each addition of thiosulfate. When the iodine color becomes quite pale, add 1 cc. of starch T.S. and continue the titration with thiosulfate until the blue color is discharged. Carry out a blank test at the same time with the same quantities of the same reagents and in the same manner and titrating as directed. The difference between the number of cc. of thiosulfate consumed by the blank test and the actual test, multiplied by 1.269 and divided by the weight in Grams of the sample taken, is the Iodine Value.

NOTE—If more than half of the iodobromide T.S. is absorbed by the portion of the substance taken, the determination must be repeated, a smaller portion of the substance under examination being used.

Saponification Value.

The Saponification Value is the number of milligrams of potassium hydroxide required to neutralize the free acids and saponify the esters contained in 1 Gm. of a fat, fatty or volatile oil, wax, resin, balsam or similar substance. It is determined as follows: Place from 1.5 to 2 Gm. of the sample, accurately weighed, in a flask of from 200- to 250-cc. capacity, and add to it exactly 25 cc. of half-normal alcoholic

* 120 to 150 mg. of linseed oil or of cod liver oil, 800 mg. to 1.0 Gm. of theobroma oil.

† Allow castor oil, cod liver oil, or linseed oil to stand for 1 hour.

potassium hydroxide. Insert into the neck of the flask, by means of a perforated stopper, an air condenser consisting of a glass tube from 70 to 80 cm. in length and from 5 to 8 mm. in diameter, and heat the flask on a water bath for 30 minutes, frequently rotating the contents. Then add 1 cc. of phenolphthalein T.S. and titrate the excess of potassium hydroxide with half-normal hydrochloric acid. Make a blank test at the same time, using exactly the same amount of half-normal alcoholic potassium hydroxide. The difference between the number of cc. of half-normal hydrochloric acid consumed in the actual test and in the blank test, multiplied by 28.05 and divided by the weight in Grams of sample taken, is the Saponification Value.

If the oil has been saturated with carbon dioxide for the purpose of preservation, it should be exposed in a shallow dish in a vacuum desiccator for 24 hours before the portions are weighed for this determination.

Unsaponifiable Matter.

The term Unsaponifiable Matter in oils or fats refers to those substances present that are not saponifiable by alkali hydroxides and are insoluble in water. It is determined as follows: Weigh 5 Gm. of the oil or fat into a 250-cc. Erlenmeyer flask, add a solution of 2 Gm. of potassium hydroxide in 40 cc. of alcohol, and heat under a reflux condenser for 2 hours, keeping the alcohol gently boiling. Evaporate the alcohol on a water bath, dissolve the residue in 50 cc. of hot water and transfer the solution to a separator, rinsing the flask with two 25-cc. portions of hot water which are added to the separator. Cool to room temperature, and extract with two successive portions of 50 cc. each of ether, adding a few drops of alcohol to facilitate the separation of the two liquids. Combine the ether extracts in another separator and wash the ether solution first with 20 cc. of a solution of sodium hydroxide (4 in 1000), then with 20 cc. of a solution of sodium hydroxide (8 in 1000), and finally with 15-cc. portions of water until the last washing is not reddened by the addition of 2 drops of phenolphthalein T.S. Transfer the ethereal solution to a tared beaker, and rinse the separator with 10 cc. of ether, adding the rinsings to the beaker. Evaporate the ether just to dryness on a water bath, and dry the residue for 30 minutes at 100°. Cool the beaker in a desiccator for 30 minutes, and weigh the residue of Unsaponifiable Matter.

Water and Sediment in Fatty Oils.

The Centrifuge—The preferred centrifuge shall have a diameter of swing (tip to tip of whirling tubes) of from 38 to 43 cm. and be operated at a speed of about 1500 r.p.m. If a centrifuge of different dimensions is used, the rate of revolution shall be calculated by the use of the following formula: $\text{r.p.m.} = 1500\sqrt{\frac{40.6}{d}}$ in which "d" represents the diameter in cm. (from tip to tip of the whirling tubes) of the centrifuge used.

The Centrifuge Tubes—The centrifuge tubes shall be pear-shaped, shall be made of suitable glass, and thoroughly annealed. The total capacity of each tube shall be about 125 cc. and the mouth shall be suitably constricted for closing with a cork. The graduations shall be clear and distinct, reading upward from the bottom of the tube. The tube shall be graduated according to the following scale:

Range	Scale Division
0 to 3 cc.	0.1 cc.
3 to 5 cc.	0.5 cc.
5 to 10 cc.	1.0 cc.
10 to 25 cc.	5.0 cc.
25 to 50 cc.	25.0 cc.
50 to 100 cc.	50.0 cc.

Method—Place exactly 50 cc. of benzene in each of two centrifuge tubes and to each tube add exactly 50 cc. of the oil, warmed if necessary to reincorporate separated stearin, and thoroughly mixed at 25°. Tightly stopper the tubes and shake them vigorously until the contents are thoroughly mixed, then immerse the tubes in a water bath at 50° for 10 minutes. Place the tubes on opposite sides of the centrifuge and whirl for 10 minutes. Read the combined volume of water and sediment at the bottom of each tube. Repeat the whirling for 10-minute periods until the combined volume of water and sediment remains constant for three consecutive readings. The sum of the volumes of combined water and sediment in the two tubes represents the percentage, by volume, of water and sediment in the oil.

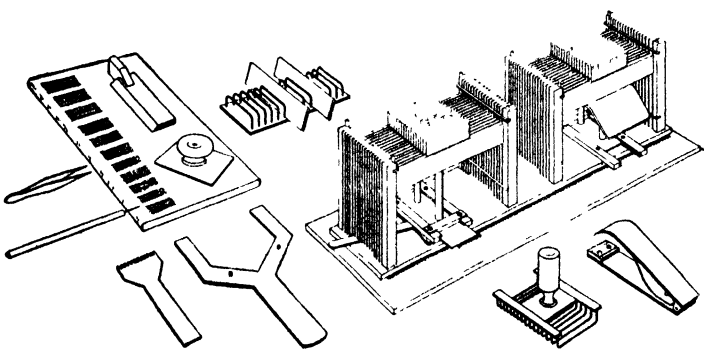
Fiber Length of Cotton

For the determination of the length and of the length distribution of cotton fibers in purified cotton.

Carry out all operations associated with the determination of fiber length of purified cotton in an atmosphere maintained at 65 per cent, ± 2 per cent, relative humidity at 21°, ± 1.5° (70° F., ± 2° F.).

For the sake of definiteness, these directions describe the mode of procedure that is well adapted to the sorter* most extensively used in the United States at the present time.

Test Apparatus—The sorter (see illustration) consists of two banks of combs rigidly mounted side by side on a common base. Each bank of combs consists of



Duplex Cotton Fiber Sorter

* **Note**—The method here described is especially adapted to the Suter-Webb Duplex Cotton Fiber sorting apparatus, but with more or less obvious alteration in procedure, may be carried out with two Baer sorters in tandem arrangement, or with a Johannsen or other similar apparatus.

at least 12 individual combs spaced 3.2 mm. apart, one behind the other, and mounted in grooves so that as they are approached during the fractionating process and no longer needed, they may be dropped below the working plane. Each individual comb has a single row of accurately aligned and sharply pointed teeth, 12 mm. long, consisting of needles 0.38 mm. in diameter. The teeth are spaced 62 to 25 mm over an extent of approximately 50 mm.

Accessory Equipment—Fiber-sorter forceps, fiber-depressing grid, fiber-depressing smooth plate, and velvet-covered plates. The sorter forceps consist of two brass pieces approximately 75 mm. long, hinged on one end and slightly curved to present a beaked aspect at the gripping end for gripping the protruding fibers close to the surfaces of the combs. Usually, one of the gripping edges has a leather or other fibrous padding. The gripping edge is approximately 19 mm. wide.

The fiber-depressing grid consists of a series of brass rods spaced 3.2 mm. apart so that they may be placed between the combs to press the fibers down between the teeth. The fiber-depressing smooth plate consists of a polished brass plate approximately 25 by 50 mm., with a knob or handle on the upper surface whereby the plate may be smoothed over the fibers as they are laid on the velvet surface of the array plates. The velvet-covered plates upon which the fibers may be arrayed are aluminum sheets approximately 100 mm. by 225 mm., by 2.4 mm. thick, covered on both sides with high-grade velvet, preferably black.

Selection of Cotton—After unrolling the cotton, prepare a representative laboratory test specimen by taking from a package containing from 8 to 16 ounces, 32 pinches (about 75 mg. each) well distributed throughout the bulk of the lap, 16 representative pinches being taken from each longitudinal half of the lap. Avoid cotton fibers at the cut ends of the lap, and take particular care to secure portions throughout the thickness of the lap. To avoid biased selection of long or short fibers, all fibers of the group pinched must be removed and not allowed to slip from between the fingers.

From packages of not more than 4 ounces in weight, take 8 pinches, and from packages weighing more than 4 ounces and not more than 8 ounces, take 16 pinches, all well distributed.

Mix the pinches in pairs promiscuously and combine each pair by gently drawing and lapping them in the fingers. Then divide each combined pair by splitting longitudinally into two approximately equal parts and utilize one part in the further mixing. (The other part may be discarded or reserved for any further tests or checks.)

Repeat the process described in the preceding paragraph with the successive halves of the bifurcated series until only 1 pinch, the final composite test portion results. Gently parallel and straighten the fibers of the final composite test portion, by drawing and lapping them in the fingers. Take care to retain all of the fibers, including as far as possible those of the neps (specks of entangled fibers) and naps (matted masses of fibers), discarding only motes (immature seed fragments with fibers) and non-fiber foreign material such as stem, leaf, and fragments of seedcoats.

From the final composite portion described in the preceding paragraph, separate longitudinally a test portion of 75 mg., ± 2 mg., accurately weighed. Retain the residue for any check test if necessary.

The Test—With the fiber-depressing grid carefully insert this weighed test portion into one bank of combs of the cotton sorter, so that it extends across the combs at approximately right angles.

With the sorter forceps grip by the free ends a small portion of the fibers extending through the teeth of the comb nearest to the operator; gently and smoothly draw them forward out of the combs, and transfer them to the tips of the teeth in the second bank of combs, laying them parallel to themselves, straight, and approximately at right angles to the faces of the combs, releasing the gripped ends as near to the face of the front comb as possible. Carefully press with the depressor grid the transferred fibers down into the teeth of the combs. Continue the operation until all of the fibers are transferred to the second bank of combs. During this transfer of the fibers, drop the combs of the first bank in succession when and as all of the protruding fibers have been removed.

Turn the machine through 180° and transfer the cotton fibers back to the *first bank* of combs in the manner described in the preceding paragraph.

Great care must be taken in evening up the ends of the fibers during both of the above transfers, arranging them as closely as possible to the front surface of the proximal comb. Such evening out of the ends of the protruding fibers may involve drawing out straggling fibers both from the front and rear aspects of the banks of combs, and redepositing them into and over the main bundle in the combs.

Turn the machine again through 180°. Drop successive combs if necessary to expose the ends of the longest fibers. It may be necessary to redeposit some straggling fibers. With the forceps withdraw the few most protuberant fibers. In this way continue to withdraw successively the remaining protuberant fibers back to the front face of the proximal comb. Drop this comb and repeat the series of operations in the same manner until all of the fibers have been drawn out. In order not to disturb seriously the portion being tested, and thereby vitiate the length fractionation into length groups, several pulls (as many as eight to ten) must be made between each pair of combs.

Lay the pulls on the velvet-covered plates alongside each other, as straight as possible, with the ends as clearly defined as possible, and with the distal ends arranged in a straight line, pressing them down gently and smoothly with the fiber-depressing smooth plate before releasing the pull from the forceps. Not less than 50 and not more than 100 pulls shall be employed to fractionate the test portion.

Group together all of the fibers measuring 12.5 mm. (about ½") or greater in length, and weigh the group to the nearest 0.3 mg. In the same manner, group together all fibers 6.25 mm. (about ¼") or less in length, and weigh in the same manner. Finally, group the remaining fibers of intermediate lengths together and weigh. The sum of the three weights shall not differ from the initial weight of the test portion by more than 3 mg. Divide the weight of each of the first two groups by the weight of the test portion to obtain the percentage by weight of fiber in the two ranges of length.

Fineness of Powders

The fineness of powders in this Pharmacopœia is expressed in descriptive terms, each of which is related to the number assigned to a certain standard sieve.

Sieves for Pharmacopœial Testing—

Sieves for pharmacopœial testing shall be of wire cloth woven (not twilled) from brass, bronze, or other suitable wire, and shall not be coated or plated. The following table gives the nominal dimensions, permissible variations, and limits for woven wire cloth of standard sieves.

Nominal Dimensions of Standard Sieves

Microns	Number	Sieve Opening, Mm.	Permissible Variation in Average Opening, Per Cent	Permissible Variation in Maximum Opening, Per Cent	Wire Diameter, Mm.
9520	2	9.52	±3	+ 5	2.11 to 2.59
4760	4	4.76	±3	+10	1.14 to 1.68
2380	8	2.38	±3	+10	0.74 to 1.10
2000	10	2.00	±3	+10	0.68 to 1.00
840	20	0.84	±5	+15	0.38 to 0.55
590	30	0.59	±5	+15	0.29 to 0.42
420	40	0.42	±5	+25	0.23 to 0.33
297	50	0.297	±5	+25	0.170 to 0.253
250	60	0.250	±5	+25	0.149 to 0.220
210	70	0.210	±5	+25	0.130 to 0.187
177	80	0.177	±6	+40	0.114 to 0.154
149	100	0.149	±6	+40	0.096 to 0.125
125	120	0.125	±6	+40	0.079 to 0.103
74	200	0.074	±7	+60	0.045 to 0.061

In any sieve, the average opening between the adjacent warp and the adjacent shoot wires, taken separately, shall conform to the width of opening specified within the specified percentage of permissible variation in the average opening. The maximum width of opening between any adjacent warp or shoot wires shall not exceed the width of opening specified by more than the specified percentage permissible variation in maximum opening. The average diameter of the warp and shoot wires, taken separately, of the cloth in any given sieve, shall be within the range of wire diameters given in the table.

For details regarding the standardization of sieves, reference should be made to National Bureau of Standards *Letter Circular* 72, July 26, 1922, or to Specification E11-39 of the American Society for Testing Materials.

Fineness of Powdered Vegetable or Animal Drugs—

The fineness of vegetable and animal drugs is expressed in this Pharmacopœia by the following terms: *Very coarse powder* (No. 8), *coarse powder* (No. 20), *moderately coarse powder* (No. 40), *fine powder* (No. 60), *very fine powder* (No 80). A powder to conform with any one of these specified terms must meet the following requirements. In the preparation of ground or powdered drugs, no portion of the drug shall be rejected during milling or sifting unless specifically permitted under the official description of the drug. It is permissible, however, to withhold *final tailings* not exceeding 5 per cent of the drug being powdered, which may be added in no greater percentage to other lots of the same drug in subsequent millings.

Standards—

A *very coarse powder* (No. 8) is one in which all particles will pass through a No. 8 standard mesh sieve and not more than 20 per cent through a No. 60 standard mesh sieve.

A *coarse powder* (No. 20) is one in which all of the particles will pass through a No. 20 standard mesh sieve and not more than 40 per cent through a No. 60 standard mesh sieve.

A *moderately coarse powder* (No. 40) is one in which all of the particles will pass through a No. 40 standard mesh sieve and not more than 40 per cent through a No. 80 standard mesh sieve.

A *fine powder* (No. 60) is one in which all of the particles will pass through a No. 60 standard mesh sieve and not more than 40 per cent through a No. 100 standard mesh sieve.

A *very fine powder* (No. 80) is one in which all of the particles will pass through a No. 80 standard mesh sieve.

Fineness of Powdered Chemicals—

The fineness of chemicals is expressed in this Pharmacopœia by the following terms: *coarse powder* (No. 20), *moderately coarse powder* (No. 40), *fine powder* (No. 80), *very fine powder* (No. 120).

Standards—

A *coarse powder* (No. 20) is one in which all of the particles will pass through a No. 20 standard mesh sieve, and not more than 60 per cent will pass through a No. 40 standard mesh sieve.

A *moderately coarse powder* (No. 40) is one in which all of the particles will pass through a No. 40 standard mesh sieve, and not more than 60 per cent will pass through a No. 60 standard mesh sieve.

A *fine powder* (No. 80) is one in which all of the particles pass through a No. 80 standard mesh sieve.

A *very fine powder* (No. 120) is one in which all of the particles pass through a No. 120 standard mesh sieve.

Method for Determining Uniformity of Fineness—For determining uniformity of degree of fineness of powdered drugs and chemicals, the following process may be used, employing standard testing sieves which meet the requirements set forth above.

For *very coarse, coarse* and *moderately coarse powders*, place from 25 to 100 Gm. of the powder to be tested upon the proper standard testing sieve with a tightly fitting receiving pan and cover. Shake the sieve in a rotary horizontal direction and vertically by tapping on a hard surface for not less than 20 minutes or until no appreciable number of particles pass through the sieve. Weigh accurately the amount remaining on the sieve and in the receiving pan.

In the case of *fine* or *very fine powders*, proceed as for *coarse* or for *moderately coarse powders*, but shake the sieve for at least 30 minutes or until no appreciable number of particles pass through the sieve.

In the case of oily or other powders which tend to clog the openings, the screen should be carefully brushed at intervals during the test. In the case of powders which tend to form lumps, such lumps should be carefully disintegrated during the sifting test. Do not increase the fineness of the powder during the sieve testing.

*Mechanical Sieve Shaker**—The fineness of a powdered drug or chemical may also be determined by screening through standard sieves in a mechanical sieve shaker. The purpose of the sieve shaker is to reproduce the circular and tapping motion given to testing sieves in hand sieving but with a uniform mechanical action. A sieve or

* The description and manner of use given here apply specifically to the Ro-Tap Testing Sieve Shaker. Any other mechanical device which duplicates the shaking and tapping force and speed of this shaker may be used in pharmacopœial tests.

a nest of sieves rests upon a horizontal solid metal base plate which is attached to a bar, one end of which is revolving in a circle 1.125 inches in diameter, the other traveling linearly to and from the center of rotation of the first, the bar measuring 14.75 inches between centers. The frequency of oscillation of the sieves is 285 ± 3 cycles per minute. At the top of the stack of sieves is placed a solid metal cover plate bearing a cork insert which projects 1 inch above the top surface of the cover plate. The cork insert is tapped at the top with a hammer striking a blow of 2.5 pounds, falling through a distance of 1.0625 inches at a rate of 150 times per minute. The cork insert must be replaced when necessary to retain the distance of the blow. The sieves are to be placed upon the sieve supporting plate, and the lower carrying plate so adjusted that it is just possible to make a complete turn of the cover plate with the unaided fingers.

Fluidextracts

Fluidextracts are liquid preparations of vegetable drugs, containing alcohol as a solvent or as a preservative, or both, and so made that each 1 cc. contains the therapeutic constituents of 1 Gm. of the standard drug which it represents.

The official fluidextracts are made by the process of percolation, the menstruum to be used being specified in each monograph. Manufacture by the usual process calls for concentration of the more diluted portion of percolate by distillation. This should be done in a vacuum distillation apparatus, the temperature in the still being kept below 60°.

The time of maceration and the rate of flow during percolation are varied for different drugs to compensate for peculiarities in extraction and in some cases to accomplish partial rejection of non-active constituents. In all cases, the maceration and rate of flow are designed to extract completely the medicinally active or important constituents from the specified quantities of drugs; but the time and rate specified may be varied to accomplish this purpose when larger or smaller quantities of drug are being treated.

Usually a cylindrical form of percolator is the best type for making fluidextracts, but for use with drugs which swell considerably in the menstruum a flaring form of percolator may be preferred.

The rate of flow of the percolate is directed in these terms: "percolate slowly," "percolate rapidly," and "percolate at a moderate rate." With reference to the extraction of 1000 Gm. of drug, "percolate slowly" means a rate not exceeding 1 cc. of percolate per minute; "percolate rapidly" means a rate of 3 to 5 cc. per minute; "percolate at a moderate rate" means a rate of 1 to 3 cc. per minute.

A fluidextract which may deposit sediment may be aged and filtered or the clear portion decanted, provided the resulting clear liquid conforms to the official standards.

The general processes of manufacture directed by the Pharmacopœia are as follows:

Process A. This process is used for preparing fluidextracts which are made with menstrua of alcohol or with mixtures of alcohol and water, by ordinary percolation.

Carefully mix 1000 Gm. of the ground drug with a sufficient quantity of the prescribed menstruum to render it evenly and distinctly damp. This usually requires from 600 cc. to 800 cc. of menstruum. Allow the dampened drug to stand for about 15 minutes, then pack it firmly in a suitable percolator, and pour on sufficient menstruum to saturate the drug and leave a stratum above. When the liquid is about to drop from the percolator, close the lower orifice, cover the percolator, and allow

the drug to macerate for about the prescribed period of time. Then proceed with the percolation at the specified rate, adding fresh menstruum as needed until the drug is exhausted of its active principles. Reserve the first 850 cc. of percolate (unless otherwise directed in the formula), recover the alcohol from the percolate subsequently collected, and concentrate the residue to a soft extract at a temperature not exceeding 60°. Dissolve this extract in the reserved percolate, and, if no assay is directed, add enough of a mixture of alcohol and water to make the fluidextract measure 1000 cc. and contain the required proportion of C_2H_5OH. Mix thoroughly. If the fluidextract being prepared is to be adjusted to a standard, assay a portion of the reserved percolate in which the soft extract has been dissolved, and dilute the remainder to the volume determined as necessary by calculation from the assay, using a sufficient quantity of an alcohol and water mixture to provide the required proportion of C_2H_5OH. Mix thoroughly.

Process B. This process is used in preparing fluidextracts, portions of the menstrua for which contain, in addition to alcohol, or a mixture of alcohol and water, definite quantities of other components such as an acid or glycerin, the two menstrua being successively employed.

Carefully mix 1000 Gm. of the ground drug with a sufficient quantity of Menstruum I (containing the special ingredient) to render it evenly and distinctly damp. From 600 cc. to 800 cc. of menstruum is usually required. Allow the dampened drug to stand for about 15 minutes, then pack it firmly in a suitable percolator and pour on the remainder of Menstruum I. When the liquid is about to drop from the percolator, close the lower orifice, cover the percolator, and allow the drug to macerate for about the prescribed period of time. Then proceed with the percolation at the specified rate, and when the first menstruum has disappeared from the surface of the drug, use Menstruum II as needed until the drug is exhausted of its active principles. Reserve the first 850 cc. of percolate, recover the alcohol from the percolate subsequently collected, and evaporate the residue to a soft extract at a temperature not exceeding 60°. Dissolve this extract in the reserved percolate, and if no assay is directed, add enough of a mixture of alcohol and water to make the fluidextract measure 1000 cc. and contain the required proportion of C_2H_5OH. Mix thoroughly. If the fluidextract being prepared is to be adjusted to a standard, assay a portion of the reserved percolate in which the soft extract has been dissolved, and dilute the remainder to the volume determined as necessary by calculation from the assay, using a sufficient quantity of an alcohol and water mixture to provide the required proportion of C_2H_5OH. Mix thoroughly.

Process C. *Fractional or Divided Percolation.*

This process is used for preparing fluidextracts, the constituents of which are injured by heat, or as an alternative for Process A or B, or in case suitable facilities for distillation and concentration are lacking. When Process C is used to prepare a fluidextract directed to be made by Process B, Menstruum I is used throughout the percolation.

Divide 1000 Gm. of the ground drug into three portions, consisting of 500 Gm., 300 Gm., and 200 Gm. Mix the first portion (500 Gm.) with sufficient of the prescribed menstruum to render it evenly and distinctly damp, transfer the dampened powder to a suitable percolator, the capacity of which should not greatly exceed the bulk of the moist drug when packed firmly, and allow it to stand for about 15 minutes

Then pack the drug in the percolator, saturate it with the menstruum, and allow it to macerate for the prescribed period of time. Then proceed with the percolation, first collecting and reserving 200 cc. of percolate, and afterwards collecting five successive portions of percolate of 300 cc. each, numbering them in the order in which they are obtained.

Dampen the second portion (300 Gm.) of the drug with a sufficient quantity of the first of the 300-cc. portions of percolate from the preceding lot of drug, and carry out the percolation as just directed for the first lot, except that the five 300-cc. portions of percolate from the first lot of drug shall first be used as menstruum in the order in which they were received, followed, if necessary, by sufficient fresh menstruum to supply the following portions of percolate: reserve the first 300 cc. of percolate, and then collect five successive portions of 200 cc. each, numbering them in the order in which they are collected.

Now dampen the third portion (200 Gm.) of the drug with a sufficient quantity of the first numbered portion of percolate from the second lot of drug, and proceed with the percolation as before, using as the menstruum the 200-cc. portions of percolate from the second lot of drug in the order received. If no assay is directed, collect and reserve 500 cc. of percolate. Mix the three reserved percolates from the three lots of drug to make 1000 cc. of fluidextract.

If the fluidextract being prepared by Process C is to be adjusted to a standard, collect and reserve only 420 cc. of percolate from the third portion of drug instead of the 500 cc. directed above. Mix the three reserved percolates from the three lots of drug, and assay a portion of the mixture. Dilute the remainder to the volume determined as necessary by calculation from the assay, using a sufficient quantity of an alcohol and water mixture to provide the required proportion of C_2H_5OH. Mix thoroughly.

Process D. This process is used for preparing fluidextracts with boiling water as the menstruum, alcohol being added as a preservative to the concentrated percolate.

To 1000 Gm. of the coarsely ground drug add about 3000 cc. of boiling water, mix well, and allow it to macerate in a suitable, covered metallic percolator for 2 hours. Then allow the percolation to proceed at the specified rate, gradually adding boiling water until the drug is exhausted. Evaporate the percolate on a water bath, or in a vacuum still, to the volume specified, cool, add the alcohol, and allow the mixture to stand in a stoppered container for several days. Then decant the clear liquid, filter the remainder into the decanted liquid, and wash the residue on the filter with a sufficient quantity of a mixture of alcohol and water to make the fluidextract measure 1000 cc. and contain the required proportion of C_2H_5OH. Mix thoroughly.

Packaging and Storage—Preserve fluidextracts in tight, light-resistant containers and avoid exposure to direct sunlight or to excessive heat.

Hardness of Soda Lime

Screen 200 Gm. of soda lime on a mechanical sieve shaker, page 653, having a frequency of oscillation of 285 ± 3 cycles per minute for 3 minutes, to remove granules coarser than the labeled particle size and also granules finer than the labeled particle size. Weigh 50 Gm. of the properly sized granules, place them in a hardness pan together with fifteen 7.9-mm. steel balls, and shake on the mechanical sieve shaker for 30 minutes. Remove the steel balls, brush the contents of the hardness

pan onto a sieve of the finest mesh indicated on the label, and shake for 3 minutes on the mechanical sieve shaker: the weight of the soda lime remaining on the sieve, multiplied by 2, is the hardness.

The hardness pan must have a diameter of 200 mm. and a concave brass bottom; the bottom of the pan must be 7.9 mm. thick at the circumference and 3.2 mm. thick at the center, and have an inside spherical radius of curvature of 109 cm.

Heavy Metals Test

The Heavy Metals Test is designed to determine the content of those metallic impurities in official substances that are colored by hydrogen sulfide under the conditions of the test. In chemicals the proportion of any such impurity is expressed as the quantity of lead required to produce a color of equal depth in a standard comparison solution, this quantity being stated as the Heavy Metals Limit expressed parts of lead per million parts of the substance (by weight).

Reagents:

Diluted Acetic Acid—See page 731.

Hydrochloric Acid—All concentrations of hydrochloric acid used in the Heavy Metals Test must be prepared from reagent hydrochloric acid, page 770, and water.

Ammonia T.S.—See page 834.

The heavy metals limit of ammonia T.S. used in this test shall not exceed 2 parts per million, when determined as directed in the monograph for *Diluted Ammonia Solution.*

Hydrogen Sulfide T.S.—See page 838.

Stock Solution of Lead Nitrate—Dissolve 159.8 mg. of lead nitrate in 100 cc. of water to which has been added 1 cc. of nitric acid, then dilute to 1000 cc. with water. This solution must be prepared and stored in glass containers free from soluble lead salts.

Standard Lead Solution—Dilute 10 cc. of the stock solution of lead nitrate, accurately measured, to 100 cc. with water. This solution must be freshly prepared. Each cc. of this standard lead solution contains the equivalent of 0.01 mg. of lead. When 0.1 cc. of standard lead solution is employed to prepare the standard to be compared with a solution of 1 Gm. of the substance being tested, the comparison solution thus prepared contains the equivalent of 1 part of lead per million parts of the substance tested.

Procedure for Testing Chemicals:

Solution A—Introduce into a 50-cc. Nessler tube 2 cc. of diluted acetic acid, and exactly the quantity of *standard lead solution* containing the lead equivalent of the heavy metals limit specified for the substance to be tested, and make up to 25 cc. with water.

Solution B—This consists of 25 cc. of the solution prepared for this test according to the specific directions in each monograph.

Transfer solutions A and B to matching 50-cc. Nessler tubes, add 10 cc. of hydrogen sulfide T.S. to each tube, mix, allow to stand for 10 minutes, then view downward over a white surface: the color of Solution B is no darker than that of Solution A.

Procedure for Testing Volatile Oils:

Shake 10 cc. of the oil with an equal volume of water to which a drop of hydrochloric acid has been added, and pass hydrogen sulfide through the mixture until it is saturated: no darkening in color is produced in either the oil or the water.

Identification Tests—General

Under this heading are placed tests which are frequently referred to in the Pharmacopœia. To conserve space they are grouped here and in the text are referred to by title and page.

These tests are to be used for the identification of official chemicals. They are not intended to be applicable to mixtures of substances unless specific directions are given for such use.

Acetate—When warmed with sulfuric acid, acetates evolve acetic acid. If acetic acid or an acetate is warmed with sulfuric acid and alcohol, the characteristic odor of ethyl acetate is evolved. With neutral solutions of acetates, ferric chloride T.S. produces a deep red color which is destroyed by the addition of mineral acids.

Aluminum—Solutions of aluminum salts yield with ammonia T.S. a gelatinous white precipitate which is insoluble in an excess of ammonium hydroxide. Sodium hydroxide T.S. or sodium sulfide T.S. produces the same precipitate which dissolves in an excess of either of these reagents.

Ammonium—Ammonium salts are decomposed by the addition of an excess of sodium hydroxide T.S., with the evolution of ammonia, recognizable by its odor and by its alkaline effect upon moistened red litmus paper exposed to the gas. Warming the solution accelerates the decomposition.

Antimony—Solutions of antimonous compounds, strongly acidulated with hydrochloric acid, yield with hydrogen sulfide an orange precipitate of antimony sulfide which is insoluble in ammonia T.S., but soluble in ammonium sulfide T.S.

Arsenate—Soluble arsenates yield with silver nitrate T.S. a reddish-brown precipitate which is soluble in diluted nitric acid and in ammonia T.S. Soluble arsenates yield a white precipitate with magnesia mixture T.S. This precipitate is soluble in hydrochloric acid, which solution, when heated, yields with hydrogen sulfide a yellow precipitate, soluble in ammonium sulfide T.S.

Arsenite—Neutral solutions of arsenites yield with silver nitrate T.S. a yellow precipitate. The precipitate is soluble in either ammonia T.S. or in diluted nitric acid. Neutral solutions of arsenites yield with cupric sulfate T.S. a green precipitate. When boiled with sodium hydroxide T.S., the precipitate becomes red in color. Solutions of arsenous salts which have been acidified with hydrochloric acid yield a yellow precipitate with hydrogen sulfide. The precipitate is insoluble in hydrochloric acid, but soluble in ammonium carbonate T.S.

Barium—Solutions of barium salts yield a white precipitate with diluted sulfuric acid. This precipitate is insoluble in hydrochloric or nitric acid. Barium salts impart a yellowish-green color to a non-luminous flame, appearing blue when viewed through green glass.

Benzoate—In neutral solutions, benzoates yield a salmon-colored precipitate with ferric chloride T.S. In moderately concentrated solutions, benzoates yield a

precipitate of benzoic acid upon acidulation with diluted sulfuric acid. This precipitate is readily soluble in ether.

Bicarbonate—(*See Carbonate*)

Bismuth—When dissolved in a slight excess of nitric or hydrochloric acid, bismuth salts yield a white precipitate upon dilution with water. This precipitate is colored brown by hydrogen sulfide, and the resulting compound dissolves in a warm mixture of equal parts of nitric acid and water.

Bisulfite—(*See Sulfite*)

Borate—Solutions of borates, acidified with hydrochloric acid, color turmeric paper brownish red; the color becomes intensified by drying, and changes to greenish black upon being moistened with ammonia T.S. When a borate is treated with sulfuric acid, methanol added, and the mixture ignited, it burns with a green bordered flame.

Bromate—Sulfurous acid, added dropwise to a solution of a bromate, produces a yellow color, which disappears upon the addition of an excess of sulfurous acid. Bromates, when ignited gently with charcoal, yield bromides which may be recognized by the characteristic reactions.

Bromide—In solutions of bromides, the addition of chlorine T.S., drop by drop, liberates bromine which is dissolved by shaking with chloroform, coloring the chloroform red to reddish-brown. Silver nitrate T.S. produces in solutions of bromides a yellowish precipitate which is insoluble in nitric acid, and slightly soluble in ammonia T.S.

Cadmium—Neutral, alkaline, or moderately acid solutions of cadmium salts yield a yellow precipitate with hydrogen sulfide. This precipitate is insoluble in alkali hydroxides, alkali sulfides, and in cold diluted acids. It is soluble in cold moderately diluted nitric acid, hot diluted hydrochloric acid or hot moderately diluted sulfuric acid.

Calcium—In neutral or alkaline solutions of calcium salts, ammonium oxalate T.S. produces a white precipitate. This precipitate is insoluble in acetic acid, but dissolves in hydrochloric acid. Calcium salts moistened with hydrochloric acid impart a transient yellowish-red color to a non-luminous flame.

Carbonate—Carbonates or bicarbonates effervesce with acids, yielding a colorless gas, which when passed into calcium hydroxide T.S. produces an immediate white precipitate. A cold solution of a soluble carbonate is colored red by phenolphthalein T.S., while a similar solution of a bicarbonate remains unchanged or is only slightly colored.

Cerium—When a cerium salt is mixed with about two and one half times its weight of lead dioxide, and the mixture boiled with nitric acid, the liquid becomes yellow.

Chlorate—Solutions of chlorates yield no precipitate with silver nitrate T.S. The addition of sulfurous acid to this mixture produces a white precipitate which is insoluble in nitric acid but soluble in ammonia T.S. Upon ignition, chlorates yield chlorides, recognizable by appropriate tests. When concentrated sulfuric acid is added to a dry chlorate, decrepitation occurs and a greenish-yellow gas is evolved. *Caution*—Only a small amount of chlorate should be used for this test and extreme caution must be exercised in performing it.

Chloride—Solutions of chlorides yield with silver nitrate T.S. a white, curdy precipitate, which is insoluble in nitric acid, but dissolves in a slight excess of am-

monia T.S. When testing alkaloidal hydrochlorides, the mixture, after the addition of ammonia, is filtered and the filtrate acidified with nitric acid. Solutions of chlorides, when warmed with potassium permanganate and diluted sulfuric acid, evolve the characteristic odor of chlorine.

Chromate—Solutions of chromates or dichromates, free from mineral acids, yield with lead acetate T.S. a yellow precipitate, which is insoluble in acetic acid. When a chromate or a dichromate is acidified with diluted sulfuric acid and solution of hydrogen peroxide added, a transient blue color is produced. Upon shaking with ether immediately, the blue color passes into the ether layer.

Citrate—To a solution of 5 cc. of a citrate (1 in 10) add 1 cc. of calcium chloride T.S. and 3 drops of bromothymol blue T.S., and slightly acidify with diluted hydrochloric acid. Add tenth-normal sodium hydroxide until the color changes to a clear blue; then boil the solution for 3 minutes, agitating it gently during the heating period: a white, crystalline precipitate appears in the liquid. This precipitate is insoluble in sodium hydroxide T.S., but dissolves in diluted hydrochloric acid.

When to a solution of a citrate, one-tenth its volume of mercuric sulfate T.S. is added, the mixture heated to boiling, then potassium permanganate T.S. added, a white precipitate is produced.

Cobalt—Solutions of cobaltous compounds yield a blue precipitate with sodium hydroxide T.S. This precipitate rapidly changes color, becoming olive-green, but if boiled soon after its formation, it becomes rose-red. Solutions of cobalt salts, when saturated with potassium chloride and treated with potassium nitrite and acetic acid, yield a yellow precipitate.

Copper—Solutions of cupric compounds, acidified with hydrochloric acid, deposit a red film of metallic copper upon a bright untarnished surface of metallic iron. An excess of ammonia T.S., added to a solution of a cupric salt, produces first a bluish precipitate and then a deep blue-colored solution. With potassium ferrocyanide T.S., solutions of cupric salts yield a red precipitate, insoluble in diluted acids.

Cyanide—To 10 cc. of a dilute solution of a cyanide, add three drops of freshly prepared ferrous sulfate T.S., 1 cc. of sodium hydroxide T.S., a few drops of ferric chloride T.S., warm, and finally acidify with diluted sulfuric acid; a blue precipitate is produced.

Dichromate—(*See Chromate*)

Ferricyanide—Solutions of ferricyanides yield a blue precipitate with ferrous sulfate T.S. This precipitate is insoluble in diluted hydrochloric acid, but is decomposed by sodium hydroxide T.S.

Ferrocyanide—Solutions of ferrocyanides yield a blue precipitate with ferric chloride T.S. With cupric sulfate T.S., ferrocyanides yield a red precipitate insoluble in diluted acids.

Glycerophosphate—Solutions of glycerophosphates yield no precipitate in the cold with ammonium molybdate T.S., but upon prolonged boiling a yellow precipitate is formed. Moderately diluted solutions of glycerophosphates, when treated with calcium chloride T.S., remain unaffected in the cold, but on boiling a precipitate is produced. When a glycerophosphate is mixed with an equal weight of powdered potassium bisulfate and gently heated in a test tube over a free flame, the very pungent odor of acrolein is evolved.

Gold—Solutions of auric salts produce with sodium hydroxide T.S. a brown precipitate which is soluble in an excess of the reagent. Solutions of auric salts,

when treated with stannous chloride T.S. and allowed to stand, slowly form a purple precipitate.

Hypophosphite—When strongly heated, hypophosphites evolve spontaneously inflammable hydrogen phosphide. Hypophosphites in solution yield a white precipitate with mercuric chloride T.S. This precipitate becomes gray when an excess of hypophosphite is present. Solutions of hypophosphites, acidulated with sulfuric acid and warmed with copper sulfate T.S., yield a red precipitate.

Iodide—Solutions of iodides, upon the addition of chlorine T.S., drop by drop, liberate iodine which colors the solution yellow to red. On shaking with chloroform the latter is colored violet. The iodine thus liberated gives a blue color with starch T.S. Silver nitrate T.S. produces in solutions of iodides a yellow, curdy precipitate which is insoluble in nitric acid and in ammonia T.S.

Iron—Ferrous or ferric compounds in solution yield a black precipitate with ammonium sulfide T.S. This precipitate is dissolved by cold diluted hydrochloric acid with the evolution of hydrogen sulfide.

Ferric Salts—Acid solutions of ferric salts yield a dark blue precipitate with potassium ferrocyanide T.S. With an excess of sodium hydroxide T.S., a reddish-brown precipitate is formed. Solutions of ferric salts produce with ammonium thiocyanate T.S. a deep red color which is not destroyed by diluted mineral acids.

Ferrous Salts—Solutions of ferrous salts yield a dark blue precipitate with potassium ferricyanide T.S. This precipitate is insoluble in diluted hydrochloric acid, but is decomposed by sodium hydroxide T.S. Solutions of ferrous salts yield with sodium hydroxide T.S. a greenish-white precipitate, the color rapidly changing to green and then to brown on shaking.

Lactate—Solutions of lactates, when acidulated with sulfuric acid, potassium permanganate T.S. added, and the mixture heated, evolve acetaldehyde which is recognizable by its odor.

Lead—Solutions of lead salts yield with diluted sulfuric acid a white precipitate which is insoluble in diluted hydrochloric or nitric acid, but completely soluble in warm sodium hydroxide T.S. and in ammonium acetate solution. With potassium chromate T.S., solutions of lead salts, free or nearly free from mineral acids, yield a yellow precipitate which is insoluble in acetic acid but soluble in sodium hydroxide T.S.

Lithium—Moderately concentrated solutions of lithium salts, made alkaline with sodium hydroxide, yield with sodium carbonate T.S. a white precipitate on boiling. The precipitate is soluble in ammonium chloride T.S. Lithium salts moistened with hydrochloric acid impart an intense crimson color to a non-luminous flame. Solutions of lithium salts are not precipitated by diluted sulfuric acid or by soluble sulfates (difference from *strontium*).

Magnesium—Solutions of magnesium salts in the presence of ammonium chloride yield no precipitate with ammonium carbonate T.S., but on the subsequent addition of sodium phosphate T.S., a white, crystalline precipitate is produced which is insoluble in ammonia T.S.

Manganese—Solutions of manganous salts yield a salmon-colored precipitate with ammonium sulfide T.S. This precipitate is dissolved by acetic acid.

Mercury—Solutions of mercury salts, free from excess of nitric acid, when applied to bright copper foil, yield a deposit, which, upon rubbing, becomes bright and silvery in appearance. With hydrogen sulfide, solutions of mercury compounds

yield a black precipitate which is insoluble in ammonium sulfide T.S., or in boiling diluted nitric acid.

Mercuric Salts—Solutions of mercuric salts yield a yellow precipitate with sodium hydroxide T.S. They yield also, in neutral solutions with potassium iodide T.S., a scarlet precipitate which is very soluble in an excess of the reagent.

Mercurous Salts—Mercurous compounds are decomposed by sodium hydroxide T.S., producing a black color. Solutions of mercurous salts yield with hydrochloric acid a white precipitate which is blackened by ammonia T.S. With potassium iodide T.S., a yellow precipitate is produced which may become green upon standing.

Molybdate—When a dry molybdenum compound is covered with sulfuric acid and heated until the acid is almost completely removed, a blue residue remains. Solutions of molybdates, acidified with nitric acid, yield a yellow precipitate on warming with a small amount of sodium phosphate T.S. This precipitate is soluble in aqueous sodium hydroxide solutions and in ammonia T.S.

Nitrate—When a solution of a nitrate is mixed with an equal volume of sulfuric acid, the mixture cooled, and a solution of ferrous sulfate superimposed, a brown color is produced at the junction of the two liquids. When a nitrate is heated with sulfuric acid and metallic copper, brownish-red fumes are evolved. Nitrates do not decolorize acidified potassium permanganate T.S. (difference from *nitrites*).

Nitrite—When treated with diluted mineral acids or with acetic acid, nitrites yield brownish-red fumes. A few drops of potassium iodide T.S. and a few drops of diluted sulfuric acid, added to a solution of a nitrite, liberate iodine which colors starch T.S. blue.

Nitroferricyanide (*Nitroprusside*)—The addition of a dilute solution of a soluble sulfide to a solution of a nitroferricyanide produces a transient purple to deep violet color, the intensity and shade of color depending upon the concentration of the solutions.

Oxalate—Neutral or alkaline solutions of oxalates yield a white precipitate with calcium chloride T.S. This precipitate is insoluble in acetic acid but is dissolved by hydrochloric acid. Hot acidified solutions of oxalates decolorize potassium permanganate T.S.

Palladium—Solutions of palladous salts yield with ammonia T.S. a salmon-colored precipitate which is soluble in an excess of the reagent. Hydrochloric acid added to this solution produces a yellow precipitate. Solutions of palladous salts yield with potassium iodide T.S. a black precipitate.

Permanganate—Solutions of permanganates acidified with sulfuric acid are decolorized by solution of hydrogen peroxide and by sodium bisulfite T.S., in the cold, or by oxalic acid T.S. in hot solution.

Peroxide—Solutions of peroxides slightly acidified with sulfuric acid yield a deep blue color upon the addition of potassium dichromate T.S. On shaking the mixture with an equal volume of ether and allowing the liquids to separate, the blue color will be found in the superimposed ether layer.

Phosphate—Neutral solutions of orthophosphates yield with silver nitrate T.S. a yellow precipitate, which is soluble in diluted nitric acid or in ammonia T.S. With ammonium molybdate T.S., a yellow precipitate is produced which is soluble in ammonia T.S.

Phosphotungstate—(*See Tungstate*)

Potassium—Potassium compounds impart a violet color to a non-luminous flame, but the presence of small quantities of sodium masks the color. In neutral, concentrated or moderately concentrated solutions of potassium salts (depending upon the solubility and the potassium content of the salt), sodium bitartrate T.S. produces a white, crystalline precipitate which is soluble in ammonia T.S., in alkali hydroxides or carbonates. The formation of the precipitate, which is usually slow, is accelerated by stirring or rubbing the inside of the test tube with a glass rod. The addition of a little glacial acetic acid or alcohol also promotes the formation of the precipitate.

Salicylate—In moderately dilute solutions of salicylates, ferric chloride T.S. produces a violet color. The addition of acids to moderately concentrated solutions of salicylates produces a white, crystalline precipitate of salicylic acid.

Selenate—Solutions of selenates yield with stannous chloride T.S. a red precipitate which redissolves upon boiling.

Selenite—Solutions of selenites yield a red precipitate with sodium bisulfite T.S.

Silver—Solutions of silver salts yield with hydrochloric acid a white, curdy precipitate, which is insoluble in nitric acid but is easily soluble in ammonia T.S. To a solution of a silver salt add ammonia T.S. and a small quantity of solution of formaldehyde; upon warming, a mirror of metallic silver is deposited upon the sides of the test tube.

Sodium—Sodium compounds after conversion to chloride or nitrate yield with cobalt-uranyl acetate T.S. a golden-yellow precipitate, which forms after several minutes agitation. Sodium compounds impart an intense yellow color to a non-luminous flame.

Strontium—Calcium sulfate T.S. produces a white precipitate with solutions of strontium salts. Strontium compounds, moistened with hydrochloric acid, impart a crimson color to a non-luminous flame.

Sulfate—Solutions of sulfates yield with barium chloride T.S. a white precipitate, which is insoluble in hydrochloric or nitric acid. With lead acetate T.S., sulfates yield a white precipitate soluble in ammonium acetate solution. Hydrochloric acid produces no precipitate when added to solutions of sulfates (difference from *thiosulfates*).

Sulfide—When treated with an acid, many sulfides yield hydrogen sulfide, recognizable by its characteristic, pungent odor.

Sulfite—When treated with hydrochloric acid, sulfites and bisulfites yield colorless sulfur dioxide, recognizable by its pungent odor which is the same as the odor of burning sulfur. This gas blackens filter paper moistened with mercurous nitrate T.S.

Tartrate—With neutral solutions of tartrates, silver nitrate T.S. produces a white precipitate. Upon dissolving this precipitate in just sufficient ammonia T.S. and warming, metallic silver is deposited on the side of the test tube, forming a mirror. On adding to a solution of tartaric acid or of a tartrate, acidified with a few drops of acetic acid, a drop of ferrous sulfate T.S., then a few drops of hydrogen peroxide T.S. and finally an excess of sodium hydroxide T.S., a purplish violet color is produced.

Thiocyanate—Solutions of thiocyanates yield a red color with ferric chloride T.S. which is not destroyed by moderately concentrated mineral acids.

Thiosulfate—Solutions of thiosulfates yield with hydrochloric acid a white precipitate which soon turns yellow, and sulfur dioxide is liberated, recognizable by

its odor. The addition of ferric chloride T.S. to solutions of thiosulfates produces a dark violet color which quickly disappears.

Tin—When metallic zinc is placed in a solution of a salt of tin acidified with hydrochloric acid, the tin is precipitated in metallic form. When dissolved in hydrochloric acid, tin produces a white or gray precipitate with mercury bichloride T.S.

Stannic—Solutions of stannic compounds yield with hydrogen sulfide a yellow precipitate, insoluble in diluted hydrochloric acid but soluble in colorless solutions of alkali sulfides.

Stannous—Solutions of stannous salts yield with mercury bichloride T.S. a white or gray precipitate, and with hydrogen sulfide, a brownish black precipitate.

Tungstate—Solutions of tungstates or phosphotungstates yield with stannous chloride T.S. a yellow precipitate, which, upon heating with hydrochloric acid, changes to blue. Solutions of tungstates, when evaporated to dryness with hydrochloric acid, leave a yellow residue which is soluble in ammonia T.S.

Vanadate—Solutions of vanadates yield with ammonium sulfide T.S. a brown precipitate, moderately soluble in an excess of the reagent to produce a reddish brown solution.

Zinc—In the presence of sodium acetate, zinc salts yield a white precipitate with hydrogen sulfide. This precipitate is insoluble in acetic acid but is dissolved by diluted hydrochloric acid. Ammonium sulfide produces a similar precipitate in neutral or alkaline solutions. Zinc salts in solution yield with potassium ferrocyanide T.S. a white precipitate which is insoluble in diluted hydrochloric acid.

Injections

Injections are liquids, usually solutions or suspensions of drugs, for parenteral use. The terms "parenteral" and "for injection" refer to administration under or through one or more layers of the skin or mucous membranes.

The provisions of this section apply to all pharmacopœial Injections, unless otherwise stated in the individual monograph, and to other pharmacopœial preparations for which compliance is indicated in the individual monograph.

Aqueous Vehicles—*Water for Injection*, page 601, is generally used as the vehicle for aqueous Injections. *Isotonic Sodium Chloride Solution*, page 490, *Ringer's Solution*, page 453, or other suitable solutions in water may be used instead of *Water for Injection* when the latter is designated in an individual monograph, unless otherwise directed in the monograph. All water vehicles meet the requirements of the *Pyrogen Test*, page 679.

Non-aqueous Vehicles—Fatty oils are generally used as the vehicle for non-aqueous Injections. Such oils shall be of vegetable origin, odorless or nearly so, with no odor or taste suggesting rancidity. They shall remain clear at 10°. They meet the requirements of the test for *Mineral oil* under *Expressed Oil of Almond*, page 21, and have a *Saponification value* not less than 185 and not more than 200, page 647, and an *Iodine value* not less than 79 and not more than 128, page 647. The free fatty acids in 10 Gm. of a suitable oil require for neutralization not more than 1 cc. of tenth-normal sodium hydroxide, page 646.

If a fatty acid is used as a component of an Injection, *Oleic Acid*, page 352, shall be used.

Synthetic mono- or di-glycerides may be used as vehicles for Injections, provided they are fluid at 10° and have an iodine value of not more than 140, page 647.

Other non-aqueous vehicles may be used which are themselves non-toxic in the volume of Injection administered and which do not interfere with the therapeutic efficacy of the preparation.

Preparation of Injections—Throughout the preparation of Injections every care must be observed to prevent undue contamination. Equipment in which the Injections are prepared should be kept covered as much as possible; vehicles should be protected, and unused portions should be discarded or promptly sterilized for subsequent use.

Injections are prepared, filled into suitable containers, the containers sealed, and the completed unit sterilized preferably within one working day. If this is not practicable, and unless the bulk Injection is bacteriostatic or can be sterilized, it must be placed in containers holding not more than the amount which can be completely processed in a working day, and stored under refrigeration at a temperature below that at which deterioration or bacterial growth will occur.

Injections containing suspended medicaments should be passed through a standard sieve of 200-mesh or finer. They may be processed in a colloid or similar type mill.

Added Substances—Substances may be added to Injections to assure the permanency or usefulness of the products, unless otherwise provided in the individual monograph; but such substances must be non-toxic and harmless in the amounts administered, and must not interfere with the therapeutic efficacy of the preparations, the assays, and the response to other tests given in the individual monographs.

Special care must be observed in the choice and usage of added substances in Injections which are administered in volumes exceeding 5 cc.

A bacteriostatic agent must be added to Injections packaged in multiple-dose containers, regardless of the method of sterilization employed, unless otherwise directed in the individual monograph.

A bacteriostatic agent may be added to Injections packaged in single-dose containers and prepared by *Aseptic Manipulation*, page 697, or by *Bacteriological Filtration* (*Process F*), page 696, or, in emergencies, by a procedure in which only one exposure at 100° is used in *Fractional Moist-Heat Sterilization* (*Process E*), page 696.

If bacteriostatic agents are added, they must be used in concentrations which will prevent the growth of all bacteria in the Injections, and sterilization processes or aseptic manipulation must be employed even though bacteriostatic agents are used.

Containers—The type of container to be used for Injections is specified in the individual monograph. See also *General Notices*, page 4, and *Containers for Injections*, page 630.

Volume of Injection in Containers—Each container shall be filled with a volume of Injection in excess of that designated, which excess shall be only sufficient to permit the withdrawal and the administration of the volume indicated.

Determination of Volume of Injection in Containers—To determine the volume of an Injection in containers, drain thoroughly into a dry, graduated cylinder, a counted number of not less than 5 of the containers if the size is 3 cc. or less, of not less than 3 of the containers if the size is more than 3 cc. and less than 10 cc., or of at least 1 container if the size is more than 10 cc., and note the volume at 25°. The size of the graduated cylinder should be such that the volume of the Injection from the

number of containers used will occupy at least 40 per cent of the graduated capacity of the cylinder.

In measuring the volume of Injections containing oil or suspended substances, warm the containers, if necessary, to facilitate mixing and draining, and thoroughly shake immediately before draining into the graduated cylinder. Then allow the liquid to cool to 25°, and note the volume.

Clarity of Solutions—Water for Injection, pharmacopœial Injections, or pharmacopœial Solutions of medicaments, intended for parenteral administration, unless exempted by the individual monographs, must be substantially free of any turbidity or undissolved material which can be detected readily, without accessory magnification (except for such optical correction as may be required to establish normal vision), when the solution is examined against a black background and against a white background with a light which at a point ten inches below the source provides an intensity of illumination not less than 100 and not more than 350 foot-candles. This intensity of illumination may be obtained from a 100-watt, inside-frosted, incandescent lamp operating at rated voltage, or from fluorescent lamps, or from any equivalent source of light. See *Clarity of Parenteral Solutions*, page 628.

Sterilization—Safe processes of sterilization are designated in the individual monographs. Other processes of sterilization equally effective may be used instead of the indicated processes, provided the Injection is not altered thereby, and conforms to all official requirements.

Sterility—Injections meet the requirements of the *Sterility Test for Liquids*, page 689.

Labeling—If the concentration of a drug in an Injection is not specified, the label on each container of such preparation shall indicate the percentage content of drug, or the amount of such drug in a definite volume of the preparation.

If a water vehicle other than *Water for Injection*, page 601, is used, the name of the vehicle used, if it is a pharmacopœial preparation, or its composition, if it is not a pharmacopœial preparation, shall be indicated on the labeling of each package.

If a non-aqueous medium is used as the vehicle, the name and percentage of each component of the vehicle shall be indicated on the label on the outside of the container of one or more ampuls.

A manufacturing lot number shall appear on each container.

If one or more substances are added to assure the permanency or the usefulness of the product, the name and quantity or proportion of each substance so used shall be indicated on the labeling.

Injections packaged for veterinary use shall be so labeled.

Loss on Drying for Chemicals

Unless otherwise directed in the monograph, use 1 to 2 Gm. of the properly mixed sample, accurately weighed, for the test. If the chemical is in the form of large crystals, reduce it to a particle size of not larger than about 2 mm. by quickly crushing. Weigh the chemical directly in a glass-stoppered, tared, shallow weighing bottle which has been previously dried, together with its closure, for 30 minutes at the same temperature or in the same drying apparatus as used for the chemical. The diameter of the weighing bottle should be such that the layer of the chemical is not thicker

than about 5 mm. For bulky substances, the layer should not be thicker than about 10 mm. After weighing, distribute the chemical as evenly as practicable over the bottom of the bottle by gentle, sidewise shaking. Then place the bottle in the drying chamber, remove the cover, and place it beside the bottle. Close the bottle before removing it from the drying chamber for reweighing, and allow it to return to room temperature before weighing.

If the chemical melts at a lower temperature than that specified for the determination of *Loss on drying*, expose the bottle with its contents for 1 to 2 hours to a temperature of 5° to 10° below the melting temperature, then dry at the specified temperature.

When the drying in to be done over sulfuric acid, the acid in the desiccator should be renewed if it has been in use longer than 10 days.

Medicine Dropper, Official

The official medicine dropper shall have its delivery end 3 millimeters in external diameter, and be adjusted to deliver 20 drops of water, weighing 1 Gm., at a temperature of 15°. A tolerance of 10 per cent below or 10 per cent above the delivery specification is permitted.

Melting Range or Temperature

For the purpose of the Pharmacopœia, the melting range or temperature of a solid is defined as those points of temperature within which or at which the solid coalesces and is completely melted, when determined as directed below.

For the determination of their melting temperatures, Pharmacopœial solids are divided into three classes:

Class I—Materials readily reduced to a powder.

Class II—Materials not readily reduced to a powder, such as fats, fatty acids, paraffin, and waxes.

Class III—Petrolatum.

Apparatus Required

1. A *round-bottom glass tube* of from 30 mm. to 40 mm. internal diameter and about 12 cm. long, flaring slightly at the top like an ordinary test tube. The walls of the tube are not more than 1.5 mm. thick at any point. The tube is made of glass which will withstand heating over an open Bunsen flame.

2. A *stirring device*, which may be made from a glass rod of about 2 mm. external diameter. It is made circular at the end to fit the container and is bent twice at right angles above the top of the container to bring its outer end within reach for convenient manipulation.

Any other apparatus or method, capable of equal accuracy, may be used. Six U. S. P. Melting Point Reference Standards are available, page 681, and may be used for checking the accuracy of a method or apparatus.

3. A *standard thermometer* preferably of Type I or Type II, page 701, covering the desired range of temperature.

4. A *capillary glass tube* about 9 cm. long and from 0.8 to 1.2 mm. internal diameter, the walls from 0.2 to 0.3 mm. thick and the tube closed at one end.

Procedure for testing materials of Class I: Reduce the sample to a very fine powder, and, unless otherwise directed, render it anhydrous when it contains water of hydration by drying it at the temperature specified in the text, or, when the substance contains no water of hydration, dry it for 24 hours over sulfuric acid.

Select a bath suitable for the melting temperature to be determined, and fill the container to a depth which will permit immersion of the thermometer to the specified depth, with the bottom of the bulb from 2 to 3 cm. above the bottom of the container.

Charge the capillary glass tube with sufficient of the dry powder to form a column in the bottom of the tube from 2.5 to 3.5 mm. high when packed down as closely as possible by moderate tapping on a solid surface. Attach the capillary tube to the thermometer by wetting both with the liquid of the bath or by means of a piece of platinum wire and adjust its height so that the material in the capillary is beside the thermometer bulb.

Heat the bath by means of a free Bunsen flame until a temperature approximately 30° below the expected melting point is reached, introduce the sample, continue heating at a temperature increment of approximately 3° per minute until a temperature 3° below the expected melting point is attained, then carefully regulate the rise in temperature to about 1° per minute until the melting is complete. The temperature at which the column of the sample is observed to collapse definitely against the side of the tube at any point is defined as the beginning of melting, and the temperature at which the sample becomes liquid throughout is defined as the end of the melting. Stir the bath constantly throughout the heating.

NOTE—Suggestions regarding liquids to be used for baths in testing materials belonging to Class I:

For temperatures up to 200°, concentrated sulfuric acid is a suitable bath. For higher temperatures, up to about 350°, a pure grade of cottonseed oil (almost colorless) will serve for a limited number of determinations. Other substitutes for sulfuric acid for use at high temperatures are: (1) a pure grade of paraffin which has been freshly distilled; (2) a clean, white, hydrogenated vegetable oil. A very satisfactory bath is prepared by dissolving, with the aid of heat, 30 parts of potassium sulfate with 70 parts of sulfuric acid, stirring constantly until the potassium sulfate is completely dissolved.

Procedure for Testing Materials of Class II: Carefully melt the material to be tested at as low a temperature as possible and draw it into a capillary tube, which is open at both ends, to a depth of about 10 mm. Cool the charged tube at 10°, or lower, for 24 hours, or in contact with ice for at least 2 hours. Then attach the tube to a standard thermometer by means of a rubber band, adjust it so that the upper edge of the material is 10 mm. below the water level of the bath, and heat it in a water bath, as directed under procedure for testing materials in Class I, except that, within 5° of the assumed melting temperature, the rate of rise of temperature is carefully regulated to about one-half degree per minute. The temperature at which the material is observed to rise in the capillary tube is taken as the melting point.

Procedure for Testing Materials of Class III: Melt the sample slowly, while stirring, until it reaches a temperature of 90° to 92°. Remove the source of the heat and allow the molten substance to cool to a temperature of 8° to 10° above the expected melting point. Chill the bulb of a thermometer, Type III, page 701, to 5°, wipe it dry, and while still cold thrust it into the molten substance so

that approximately the lower half of the bulb is submerged. Withdraw it immediately and hold it vertically away from the heat until the wax surface dulls, then dip it for 5 minutes into a water bath having a temperature not greater than 16°.

Fix the thermometer securely in a test tube by means of a cork so that the lowest point is 15 mm. above the bottom of the test tube. Suspend the test tube in water in a beaker at a temperature of about 16°, and raise the temperature of the bath to 30° at the rate of 2° per minute, then at a rate of 1° per minute until the first drop leaves the thermometer. The temperature at which the first drop leaves the thermometer is the melting point. Use a freshly melted portion of the sample for each determination. If the variation of three determinations is less than 1°, take the average of the three. If the variation of three determinations is greater than 1°, make two additional determinations and take the average of the five.

Nicotinic Acid or Nicotinamide Assay

Microbiological Method

Test Solution of the Material to be Assayed—Place an accurately weighed quantity of the material to be assayed, sufficient to represent approximately 0.1 mg. to 1.0 mg. of nicotinic acid, in a 300-cc. flask, add 100 cc. of normal sulfuric acid, and mix thoroughly. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, cool, add sodium hydroxide T.S. to produce a pH of 6.8, and add sufficient water to make a measured volume containing approximately 0.1 microgram of nicotinic acid per cc.

Standard Nicotinic Acid Solution—Dissolve an accurately weighed 50-mg. portion of U. S. P. Nicotinic Acid Reference Standard in alcohol, and add sufficient alcohol to make 500 cc. Store this stock solution in a refrigerator. Prepare the Standard Solution by diluting 1 cc. of the stock solution, which has been warmed to room temperature, with sufficient distilled water to make 1000 cc., representing 0.1 microgram of the Reference Standard in each cc. of solution. Prepare fresh Standard Solution for each assay.

Basal Medium Stock Solution—

Acid-hydrolyzed Casein Solution ...	25 cc.
Cystine-Tryptophane Solution	25 cc.
Dextrose Anhydrous	10 Gm.
Sodium Acetate Anhydrous	5 Gm.
Adenine-Guanine-Uracil Solution	5 cc.
Riboflavin-Thiamine-Biotin Solution	5 cc.
p-Aminobenzoic Acid-Calcium Pantothenate-Pyridoxine Solution	5 cc.
Salt Solution A	5 cc.
Salt Solution B ..	5 cc.

Mix the ingredients, adjust the solution to a pH of 6.8, and add sufficient distilled water to make 250 cc.

Acid-hydrolyzed Casein Solution—Mix 100 Gm. of vitamin-free casein with 500 cc. of constant-boiling hydrochloric acid (approximately 20 per cent HCl) and reflux the mixture for 24 hours. Remove the hydrochloric acid from the mixture by distillation under reduced pressure until a thick paste remains. Redissolve the resulting paste in distilled water, adjust the solution to a pH of 3.5 ($\pm$0.1) with sodium hy-

droxide T.S., and add sufficient distilled water to make 1000 cc. Add 20 Gm. of activated charcoal, stir for 1 hour, and filter. Repeat the treatment with activated charcoal if the filtrate does not appear straw colored to colorless. Store this solution under toluene in a refrigerator. Filter the solution if a precipitate forms on storage.

Cystine-Tryptophane Solution—Suspend 4 Gm. of *l*-cystine and 1 Gm. of *l*-tryptophane (or 2 Gm. of *d,l*-tryptophane) in 700 to 800 cc. of distilled water, heat to 70° to 80°, and add 20 per cent hydrochloric acid, dropwise, with stirring, until the solids are dissolved. Cool to room temperature and add sufficient distilled water to make 1000 cc. Store the solution in a refrigerator.

Adenine-Guanine-Uracil Solution—Dissolve 0.1 Gm. each of adenine sulfate, guanine hydrochloride, and uracil, with the aid of heat, in 5 cc. of 20 per cent hydrochloric acid, and add sufficient distilled water to make 100 cc. Store in a refrigerator.

Riboflavin-Thiamine Hydrochloride-Biotin Solution—Prepare a solution containing, in each cc., 20 micrograms of riboflavin, 10 micrograms of thiamine hydrochloride, and 0.04 microgram of biotin by dissolving crystalline riboflavin, crystalline thiamine hydrochloride and crystalline biotin (free acid) in fiftieth-normal acetic acid. Store the solution, protected from light, under toluene in a refrigerator.

***p*-Aminobenzoic Acid-Calcium Pantothenate-Pyridoxine Hydrochloride Solution**—Prepare a solution in neutral 25 per cent alcohol to contain 10 micrograms of *p*-aminobenzoic acid, 20 micrograms of calcium pantothenate, and 40 micrograms of pyridoxine hydrochloride in each cc. Store the solution in a refrigerator.

Salt Solution A—Dissolve 25 Gm. of monobasic potassium phosphate and 25 Gm. of dibasic potassium phosphate in sufficient distilled water to make 500 cc. of solution. Add 5 drops of concentrated hydrochloric acid and store under toluene.

Salt Solution B—Dissolve 10 Gm. of magnesium sulfate, 0.5 Gm. of reagent sodium chloride, 0.5 Gm. of ferrous sulfate, and 0.5 Gm. of manganese sulfate in sufficient distilled water to make 500 cc. Add 5 drops of concentrated hydrochloric acid and store under toluene.

Stock Culture of Lactobacillus arabinosus 17–5—Dissolve 2 Gm. of yeast extract in 100 cc. of distilled water, add 0.5 Gm. of anhydrous dextrose, 0.5 Gm. of anhydrous sodium acetate and 1.5 Gm. of agar, and heat the mixture on a steam bath until the agar has dissolved. Add approximately 10-cc. portions of the hot solution to test tubes, plug the tubes with non-absorbent cotton, sterilize in an autoclave at 15 pounds pressure (121.5°) for 20 minutes, and allow to cool in an upright position. Prepare stab cultures in 3 or more of the tubes, using a pure culture of *Lactobacillus arabinosus* 17–5,* incubate for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ±0.5°, and finally store in a refrigerator. Prepare a fresh stab of the stock culture every week, and do not use for inoculum if the culture is more than 1 week old.

Culture Medium—To each of a series of tubes containing 5 cc. of the basal medium stock solution add 5 cc. of distilled water containing 1 microgram of nicotinic acid. Sterilize in an autoclave at 121.5° for 20 minutes.

* Pure cultures of *Lactobacillus arabinosus* 17–5 may be obtained from the American Type Culture Collection, Georgetown University Medical School, Washington, D. C., as number 8014.

Inoculum—Make a transfer of cells from the stock culture of *Lactobacillus arabinosus* 17–5 to a sterile tube containing 10 cc. of culture medium. Incubate this culture for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ±0.5°. The cell suspension so obtained is the inoculum.

Assay Procedure—Prepare standard nicotinic acid tubes as follows: To duplicate tubes, 16 × 150 mm. in size, add 0.0 cc., 0.5 cc., 1.0 cc., 1.5 cc., 2.0 cc., 2.5 cc., 3.0 cc., 3.5 cc., 4.0 cc., 4.5 cc., and 5.0 cc., respectively, of the Standard Nicotinic Acid Solution. To each of these tubes add 5 cc. of basal medium stock solution and sufficient distilled water to bring the volume in each tube to 10 cc.

Prepare tubes containing the material to be assayed as follows: To duplicate tubes add, respectively, 1.0 cc., 2.0 cc., 3.0 cc., and 4.0 cc. of the test solution of the material to be assayed. To each of these tubes add 5 cc. of basal medium stock solution and sufficient distilled water to bring the volume in each tube to 10 cc.

After thorough mixing, plug the tubes of the two series mentioned above with non-absorbent cotton, and autoclave at 15 pounds pressure (121.5°) for 15 minutes. Cool, aseptically inoculate each tube with 1 drop of inoculum, and incubate for 72 hours at any selected temperature between 30° and 37°, but held constant to within ±0.5°. Contamination of the assay tubes with any organism other than *Lactobacillus arabinosus* invalidates the assay.

Transfer the contents of each tube to a suitable container, using approximately the same quantity of distilled water in each instance for rinsing. Titrate the contents of each container with tenth-normal sodium hydroxide, using bromothymol blue T.S. as the indicator, or to a pH of 6.8 measured electrometrically.

Calculation—Prepare a standard curve of the nicotinic acid standard titration by plotting the average of the titration values expressed in cc. of tenth-normal sodium hydroxide for each level of nicotinic acid standard solution used, against micrograms of nicotinic acid contained in the respective tubes. From this standard curve, determine by interpolation the nicotinic acid content of the test solution in each tube. Discard any values which show more than 0.4 or less than 0.05 microgram of nicotinic acid in each tube. Calculate the nicotinic acid content in each cc. of test solution for each of the tubes. The nicotinic acid content of the test material is calculated from the average of the values obtained from not less than 6 of these tubes which do not vary by more than ±10 per cent from the average. If the titration values of less than 6 of the tubes containing the test solution are within the range of the titration values of the nicotinic acid standard tubes containing 0.05 to 0.4 microgram of nicotinic acid, the data are insufficient to permit calculation of the nicotinic acid content of the test material. Titration values exceeding 2 cc. for the tubes of the standard nicotinic acid solution series containing 0.0 cc. of the solution indicate the presence of an excessive amount of nicotinic acid in the basal medium stock solution and invalidate the assay.

Nitrogen (Total) by the Kjeldahl Method (Method I)

Nitrates and Nitrites Absent—Place about 1 Gm. of the substance, accurately weighed, in a 500-cc. Kjeldahl flask of hard glass. The material to be tested, if solid or semi-solid, may be wrapped in a sheet of nitrogen-free filter paper for convenience in transferring it to the flask. Add 10 Gm. of powdered potassium sulfate or anhydrous sodium sulfate, 500 mg. of powdered cupric sulfate, or 300 mg. of

selenium, and 20 cc. of sulfuric acid. Incline the flask at an angle of about 45° and gently heat the mixture, keeping the temperature below the boiling point of the mixture until frothing has ceased. Increase the heat until the acid boils briskly, and continue the heating until the solution has been clear green in color for 30 minutes. Allow the mixture to cool, add 150 cc. of water, thoroughly mix the contents of the flask, and cool again. Add cautiously 100 cc. of a 30-per cent solution of sodium hydroxide, added so as to cause the solution to flow down the inner side of the flask to form a layer under the acid solution. Add a few pieces of granulated zinc, and connect the flask, by means of a Kjeldahl connecting bulb, with a condenser, the delivery tube from which dips beneath the surface of a mixture of 30 cc. of half-normal hydrochloric or sulfuric acid and 25 cc. of water contained in an Erlenmeyer flask or a wide-mouth bottle of about 500-cc. capacity. Mix the contents of the Kjeldahl flask by gentle rotation, and distil until about two-thirds of the contents of the flask has distilled over. Add about 3 drops of methyl red T.S. to the contents of the receiving vessel and determine the excess of acid by titration with half-normal sodium hydroxide. Run a blank test and make necessary corrections. Each cc. of half-normal acid consumed is equivalent to 7.004 mg. of nitrogen.

When the nitrogen content of the substance is known to be low, the half-normal hydrochloric or sulfuric acid may be replaced by tenth-normal acid, and tenth-normal alkali should then be used in titrating the excess of acid. One cc. of tenth-normal hydrochloric or sulfuric acid is equivalent to 1.401 mg. of nitrogen.

With Nitrate Present—Place a quantity of the substance, accurately weighed, corresponding to about 150 mg. of nitrogen, in a 500-cc. Kjeldahl flask of hard glass, and add thereto 25 cc. of sulfuric acid in which 1 Gm. of salicylic acid has previously been dissolved. Mix the contents of the flask thoroughly, and allow the mixture to stand for 30 minutes with frequent shaking. Add to the mixture 5 Gm. of powdered sodium thiosulfate and again mix thoroughly, then add 500 mg. of powdered cupric sulfate, or 300 mg. of selenium, and proceed as directed previously for *Nitrates and Nitrites Absent,* beginning with "Incline the flask at an angle of about 45°."

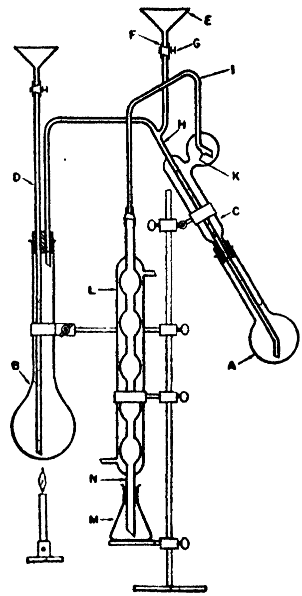
When the nitrogen content of the substance is known to exceed 10 per cent, from 500 mg. to 1.0 Gm. of benzoic acid may be added, prior to digestion, to facilitate the decomposition of the substance.

NOTE—There are certain alkaloids and other nitrogen-containing organic compounds that will not yield all of their nitrogen to digestion with sulfuric acid, and this method, therefore, cannot be used for the determination of nitrogen in all organic compounds.

Nitrogen (Total) by the Semi-Micro Kjeldahl Method (Method II)

Apparatus—The apparatus (see illustration) should be constructed throughout of glass of the resistance type. The digestion and distillation flask (*A*) is a 200-cc. round-bottom boiling flask, with a neck approximately 120 mm. long. The steam generator (*B*) is a 1000-cc. Kjeldahl flask. The distillation head (*C*) serves as a spray trap and as a means for the introduction of alkali and of steam into flask *A*. The tube (*D*), which is fitted with a funnel at its top, serves as a safety valve for the flask *B* and allows replenishment of the supply of water. The funnel (*E*) is attached by rubber tubing (*F*), closed by the pinch cock (*G*), to the steam tube (*H*), and permits the addition of alkali to flask *A*. The delivery tube (*I*) is pierced with a hole at

the point K to avoid clogging by condensate. The condenser (L) has a jacket 30 to 40 cm. long and is so arranged that the bottom of the condensing tube (N) dips beneath the surface of the solution in the absorption flask (M), which has a capacity of 250 to 300 cc. The end of the condensing tube is beveled. When the distillation apparatus is permanently assembled, the distillation head with its accessory tubes may be lagged with a paste of asbestos and magnesium carbonate. The flask (A) may also be shielded from the air by cloth or asbestos paper during the distillation.



Semi-micro Kjeldahl Apparatus

The rubber stopper used for attaching the digestion flask to the distillation apparatus should be lubricated with glycerin. All rubber used in the apparatus should be boiled for 10 minutes in approximately normal sodium hydroxide and thoroughly washed with water before its first use.

The steam generator (B) is filled with water to which has been added a few drops of sulfuric acid. Fragments of pumice stone should be placed in the generator to prevent bumping. Other anti-bumping devices may be employed if desired. The apparatus should be steamed out, with the digestion flask (A) containing 30 cc. of a solution of sodium hydroxide (4 in 10), before beginning a series of analyses. Place in the absorption flask (M) 15 cc. of a solution of boric acid (1 in 25), 3 drops of methyl red T.S., and sufficient water to cover the open end of the condensing tube (N). Collect from 80 to 100 cc. of distillate, and titrate with hundredth-normal sulfuric acid to obtain the correction factor to be applied to each test.

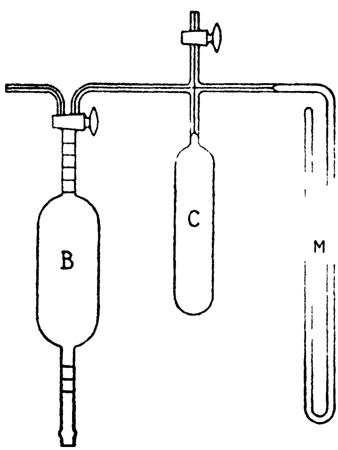
The absorption flasks should be reserved for this purpose, and after use should be thoroughly rinsed with water, stoppered tightly, and set aside to await subsequent use.

Method—Place in the digestion flask (A) an accurately weighed or measured quantity of the material, using a quantity thought to contain from 2 to 3 mg. of nitrogen. Add 1 Gm. of a powdered mixture of 10 parts of potassium sulfate and 1 part of cupric sulfate, or about 0.6 part of selenium. Finally wash down any adhering material from the neck of the flask with a fine jet of water. Add 7 cc. of sulfuric acid, allowing it to rinse down the wall of the flask, then, while swirling the flask, add 1 cc. of 30 per cent hydrogen peroxide cautiously down the side of the flask.

Heat the flask over a free flame or an electric heater until the solution has a clear blue color and the sides of the flask are free from carbonaceous material. (Do not add hydrogen peroxide during the digestion.) Cautiously add to the digestion mixture 20 cc. of water, cool the solution, and connect the flask to the distillation apparatus. Add through the funnel (E) 30 cc. of a solution of sodium hydroxide (4 in

10), rinse the funnel with 10 cc. of water, tightly close clamp (*G*), and begin the distillation with steam at once. Receive the distillate in 15 cc. of a solution of boric acid (1 in 25), to which has been added 3 drops of methyl red T.S., and sufficient water to cover the end of the condensing tube. Continue the distillation until the distillate measures from 80 to 100 cc. Remove the absorption flask, rinsing the end of the condensing tube with a small quantity of water, and titrate the distillate with hundredth-normal sulfuric acid.

Note—If a quantity of material containing greater amounts of nitrogen is taken, fiftieth-normal or tenth-normal sulfuric acid may be employed in the titration, using such a normality of acid that at least 15 cc. will be required for the titration. If the total dry weight of material taken is greater than 100 mg., the quantities of sulfuric acid and of sodium hydroxide should be increased proportionately.



Nitrous Oxide Assay Apparatus

Nitrous Oxide Assay Apparatus

The gas burette, B, consists of a bulb with a lower stem and an upper stem, sealed to a two-way capillary stopcock. Each stem has an internal diameter of 8 mm., and is graduated in tenths of a cc. The length of the upper stem is chosen so that the graduated volume is over 5 cc. For convenience the graduations are marked on the basis of 100 at the stopcock and thence downward to 99, 98, etc. On the lower stem a calibration point is located so that the volume included between that point and the stopcock is 100 cc. This point is marked 100 and through a range of 1 cc. above and below it the stem is graduated in tenths of a cc. For convenience, the major graduations, proceeding downward, are marked 99, 100, and 101. A levelling bulb is connected by means of rubber pressure tubing to the lower stem.

One arm of the capillary stopcock is sealed directly into one arm of the vertical four-way juncture consisting of capillary tubing. The downward arm of the four-way juncture is sealed to the condensation bulb, C, the stem of which consists of tubing of 5-mm. internal diameter. The capacity of the bulb, up to the capillary tubing (approximately 60 cc.), is accurately determined. The right-hand arm of the four-way juncture is sealed to a mercury manometer, M, made of glass tubing of 5-mm. internal diameter. The manometer is equipped with a scale graduated in mm. The upper arm of the four-way juncture is sealed to a capillary stopcock, which provides the only direct connection of the system with the atmosphere. This stopcock and also the burette stopcock must be of the best grade for high vacuum work. A pint Dewar jar is used for the liquid nitrogen bath into which the condensation bulb is to be immersed and it is arranged so that it may be conveniently raised and lowered or removed entirely from the bulb.

Optical Rotation

In a ray of ordinary light the vibrations take place in a plane at right angles to the direction of propagation, but the vibration direction is at random. In a ray of *plane polarized light*, commonly designated as *polarized light*, the vibrations take place in only one plane parallel to the direction of propagation. Many chemicals or their solutions have the property of thus polarizing light and rotating the plane either to the right or to the left. This property is referred to as *optical activity*, or *optical rotation*, and is inherently related to the chemical constitution of the substance.

The extent of the optical activity or rotation is measured in degrees, and the instrument used for this measurement is generally called a polariscope. The character of the rotation, that is, whether to the right or to the left, is indicated by placing a plus sign (+) or a minus sign (−) before the number indicating the degrees of rotation, as: +20°, meaning 20° to the right, or −20°, meaning 20° to the left.

Angular rotation represents the number of degrees a substance or its solution, under specified conditions of concentration, temperature, and length of the tube, will rotate the plane of polarization. When the term *optical rotation* is used in this Pharmacopœia, it refers to *angular rotation.*

The *specific rotation*, $[\alpha]$, of a liquid is defined as the angular rotation in degrees through which the plane of polarization of polarized monochromatic light is rotated by passage through 1 decimeter (100 mm.) of the liquid, calculated to the basis of a specific gravity of 1. In the case of solutions of an optically active substance the specific rotation is calculated to the basis of a concentration of 1 Gm. of solute in 1 cc. of solution.

Specific rotation is usually expressed by the term $[\alpha]_x^t$, the letter t indicating, in centigrade degrees, the temperature at which the observed rotation is determined, while the letter x indicates the characteristic spectrum line of the light used. In this Pharmacopœia, unless otherwise indicated, the temperature at which determinations of angular or specific rotation are made is 25°, and the spectrum line is the D line of the sodium spectrum.

The temperature at which the rotary activity is observed must be indicated because the specific gravity and the degree of rotation vary appreciably with the temperature.

For calculating the specific rotatory power of an optically active liquid substance, or the solution of an optically active solid, the following formulas are of general application:

I. For liquid substances $[\alpha]_D^t = \frac{a}{ld}$

II. For solutions $[\alpha]_D^t = \frac{100a}{lpd}$

or $[\alpha]_D^t = \frac{100a}{lc}$

For calculating the specific rotation $[\alpha]$ using these formulas, the determination of the following factors is necessary:

a = the observed rotation in degrees of the liquid at a temperature t, using a sodium light.

l = the length of the tube in decimeters.

d = the specific gravity of the liquid or solution at the temperature of observation.

p = the concentration of the solution expressed as the number of grams of active substance in 100 Gm. of solution.

c = the concentration of the solution expressed as the number of grams of active substance in 100 cc. of solution.

Proximate Assays (Alkaloidal Drug Assays)

Most alkaloids are practically insoluble in water, but they are soluble in certain organic solvents which are immiscible with water, such as chloroform, ether, amyl alcohol, benzene, etc., or mixtures of these. The salts of the alkaloids, however, are usually soluble in water, but in most cases insoluble in nearly all of the organic solvents. The process of assay by immiscible solvents, which is generally known as the "shaking out" process, is based on this property of alkaloids. It is carried out by treating the drug, or a concentrated liquid extract of it, with a solvent immiscible with water, in the presence of an excess of alkali which liberates the alkaloid. The free alkaloid is dissolved by the immiscible solvent from which it is removed by means of an excess of dilute acid. The acid solutions are then extracted with an immiscible solvent in the presence of an excess of alkali, and the immiscible solvent evaporated to obtain the alkaloid, which is either weighed or titrated with standard acid.

Preparation of the Drug for Assay—The drug to be extracted should be ground to a powder of the fineness designated. The definition of powders will be found on page 651. Care should be taken to avoid the loss of water during the powdering of the drug. If it is impossible to avoid this loss, the drug should be dried at a low temperature before powdering, the loss of water noted, and a correction made in the final calculations.

Weighing for Assay—In weighing bulky crude drugs for the assay, an accuracy to within 10 mg. for quantities of 5 Gm. and over is sufficient. Portions of pilular extracts or ointments may be weighed on a piece of waxed or parchmentized paper, the surplus paper cut away, and the paper with the sample dropped into the vessel containing the solvent. In transferring weighed portions to a separator, the vessel containing the material to be assayed should be thoroughly rinsed and the rinsings added to the separator.

Extraction of Drugs—The alkaloidal content of alkaloid-bearing drugs is usually extracted by one of the following methods:

A. Maceration—An accurately weighed portion of the ground drug is treated with the specified solvent or mixture of solvents, made alkaline with ammonia T.S., and thoroughly mixed. It is then allowed to macerate for 12 to 24 hours with occasional agitation, or for a shorter period with continuous agitation. At the end of this period, the drug is allowed to settle, an aliquot of the solvent decanted, and treated as described for the purification of the alkaloids.

B. Percolation—An accurately weighed quantity of the ground drug is placed in a suitable container and completely saturated with the specified solvent or mixture of solvents, and allowed to stand for 5 minutes. A quantity of ammonia T.S. sufficient to make the mixture distinctly alkaline is added and thoroughly mixed with the drug. The mixture is then transferred to a cylindrical percolator, previously prepared by packing the outlet with purified cotton. A small amount of the solvent may be used to rinse the container and the rinsing added to the percolator. The drug is allowed

to macerate for a suitable period of time (from 1 to 12 hours or over night, depending upon the drug to be assayed). Then the drug is firmly packed, a pledget of purified cotton placed above it, and percolated slowly with the solvent until it is completely exhausted of its alkaloid contents. Complete extraction of the alkaloid is determined by evaporating about 4 cc. of the last percolate to dryness, dissolving the residue in 0.5 cc. of approximately half-normal acid and adding a drop of mercuric iodide T.S. (Valser's Reagent), or, when testing for caffeine or colchicine, a drop of iodine T.S.; not more than a slight turbidity should be produced. The percolate is then treated for the purification of the alkaloids.

C. Continuous Extraction—An accurately weighed portion of the ground drug is placed in an extraction thimble and the thimble inserted into a suitable extractor (a Soxhlet extractor of appropriate size is satisfactory). The drug is moistened with the specified solvent and mixed by means of a stirring rod and allowed to stand about 5 minutes. It is then made alkaline with the specified quantity of ammonia T.S. and thoroughly mixed. The stirring rod is rinsed with a small portion of the solvent and the drug macerated for 6 to 12 hours or over night. The drug is then packed in the thimble, covered with a pledget of purified cotton, a sufficient quantity of solvent is added, and the drug extracted for a specified period of time or until completely extracted.

Purification of the Alkaloids—The alkaloidal solution obtained by any of the extraction methods is usually contaminated with other extractives which interfere with the volumetric or gravimetric determination of the alkaloids. To effect their purification, the alkaloids are removed from the immiscible solvent by extracting with an acid, then the acid solution, after alkalinization, usually with alkali hydroxide, is extracted with an immiscible solvent.

The volume and strength of the acid to be used are usually left to the discretion of the operator. It is best, however, to keep the total volume as small as possible. For the first extraction, it is advisable to use at least 10 cc. of approximately normal acid or sufficient to render the mixture distinctly acid. When the drug contains a large amount of fat, a smaller volume of more concentrated acid may be used advantageously to prevent emulsions in the first extraction. For succeeding extractions, it is preferable to use a dilution of 5 cc. of the acid with 5 cc. of water. In all assays, the extraction should be continued until 0.5 cc. of the last acid washing shows not more than a slight turbidity on the addition of a drop of mercuric iodide T.S. (Valser's Reagent), or, in the case of caffeine and colchicine, on the addition of a drop of iodine T.S. The acid extracts, before the next step is begun, should be clear or practically so. If not clear, filter or treat as follows: Shake the combined acid extracts with one or more 10-cc. portions of the appropriate immiscible solvent until the acid solution is clear or practically so. Then wash the immiscible solvent extracts with one or more 5-cc. portions of water, acidified with hydrochloric or sulfuric acid, and add these washings to the acid solution.

The acid solution is then made alkaline, in most cases with ammonia T.S., and extracted with several successive portions of the appropriate immiscible solvent. The volume of the latter to be used in each operation is not less than half that of the water solution, and the operation must be repeated as long as any alkaloid is extracted by the immiscible solvent. To determine the completion of extraction, evaporate 1 cc. of the last extraction and dissolve the residue in 0.5 cc. of approximately half-normal hydrochloric acid: the resulting solution should show not more than a

slight turbidity on the addition of a drop of mercuric iodide T.S. (Valser's Reagent), or, in the case of caffeine and colchicine, on the addition of a drop of iodine T.S. The number of extractions required depends largely on the character of the alkaloid. With most alkaloids it is advisable to extract several times before testing.

Washing—The stems of separators and funnels and the lips of flasks, separators and graduates, from which solvents, containing alkaloids, have been drawn or poured, should be carefully washed with some of the solvent to prevent loss and to remove any of the alkaloids left by evaporation. These washings should be added to the other extractions containing the alkaloids.

Determination of Alkaloids—The solution of the purified alkaloids in the immiscible solvent is carefully evaporated to dryness on a steam bath or with a current of air. When the alkaloidal residue is to be determined volumetrically, it should be softened by the addition of about 1 cc. of neutralized alcohol or ether, an accurately measured volume of volumetric acid added, usually one and one-half to twice the volume required for the quantity of alkaloid present, and the mixture gently warmed to insure the complete solution of the alkaloid. If preferred, the alkaloidal residue may be dissolved in chloroform, the standard acid added, and the chloroform completely removed by evaporation. A sufficient quantity of water is added to make the volume of the mixture measure at least 25 cc. and the excess of acid titrated with volumetric alkali, using 1 to 2 drops of the appropriate indicator.

When the alkaloidal residue is to be weighed, it is dried to constant weight at 100–110°. If the final solvent has been chloroform, the last traces of that solvent should be removed by the addition of a few cc. of neutralized ether or alcohol, followed by evaporation. Care must be taken to avoid loss by decrepitation, especially when evaporating chloroform solutions of nux vomica alkaloids. Decrepitation may usually be prevented by the addition of a little alcohol after the solution has been reduced to a volume of 1 or 2 cc., evaporating at a low temperature, and rotating the container during the evaporation.

Indicator—Methyl red T.S. is to be used as the indicator in volumetric determinations. The same solution of indicator used in titrating the alkaloids should also be used in evaluating the volumetric solutions.

Aliquots—When using aliquots, the solvent and the aliquot should be measured at the same temperature. When volatile liquids are being handled, a lower temperature and a more quickly conducted operation will reduce the loss by evaporation.

Apparatus for Proximate Assays—When a container of definite size and shape is recommended in a proximate assay process, it is understood that this is advisory and not obligatory, except when volumetric flasks, measuring burettes, or other exact measuring apparatus are specified.

Adsorbents—In assaying fluidextracts, tinctures and other preparations of alkaloid-bearing drugs, it is often necessary to evaporate these to dryness and, to avoid loss and to aid in the evaporation, they are usually added to some adsorbent material. Paper pulp or asbestos fibers should be used for this purpose. Such adsorbent material must be acid- and alkali-washed, then rendered neutral by washing with water, and dried before use.

Emulsions—The shaking or rotation of a water solution with an immiscible solvent in a separator should ordinarily be continued for about 1 minute. Long or violent agitation should be avoided as emulsions are likely to form, especially in alkaline solutions. Hyoscyamus, belladonna and stramonium leaves sometimes con-

tain saponins which cause troublesome emulsions. Should emulsions prove persistent, draw off the emulsified portion and add an excess of either solvent. This usually breaks the emulsion and permits a complete separation. It is sometimes preferable to break the separated emulsion by the addition of a small amount of anhydrous sodium sulfate. If this is done, it becomes necessary to wash the residue with additional solvent to remove the alkaloid completely.

Emulsification is sometimes prevented by increasing the volume of the water or of the immiscible solvent. Chloroform and ether solutions of drugs which contain large proportions of fat may form troublesome emulsions. In such cases it is advisable to add sufficient sulfuric acid to assure acidity, and to evaporate the volatile solvent, while stirring with a glass rod. When the resinous and fatty matter has been agglutinated, cool the acid solution and filter it through a small, wetted filter into a separator. Redissolve the residue in 15 cc. of ether, add 5 to 10 cc. of tenth-normal acid, evaporate the ether as before, with continued stirring, and pour the acid solution through the filter into the separator. Repeat the extraction of the fatty residue with dilute acid two or three times and finally wash the filter free from alkaloids.

Pyrogen Test

Test Animal—Use healthy rabbits weighing 1500 Gm. or more which have been maintained for at least 1 week on a uniform unrestricted diet and have not lost weight during this period. Use an accurate clinical rectal thermometer and test it to determine the time required to reach maximum temperature. Other recording devices of equal sensitivity are acceptable. Do not use animals which have been used for previous pyrogen tests unless they have had a rest period of not less than 48 hours. In testing allergen-containing materials, the test animal shall not be used more than once with the same allergen. If the animals have not been used for tests during the previous two weeks, take four rectal temperature readings on each of the animals at 2-hour intervals 1 to 3 days before use. Insert the thermometer or other recording device beyond the internal sphincter, and allow it to remain a sufficient time to reach maximum temperature, as determined above, before the reading is recorded. Do not use in the test those animals with a temperature in excess of 39.8°. House test animals in individual cages protected from disturbances likely to cause excitement. Exercise particular care to avoid exciting the animals on the day of taking the control temperatures and on the test day. Maintain the animals in an environment of uniform temperature (±5°) for at least 48 hours prior to and during the test period. Preferably they should be in quarters maintained at constant temperature and humidity.

Conduct of Test—Perform the test in a room in which the temperature and the humidity are maintained at the same level as that of the room in which the animals are housed for the test. During the test, the animals may be restrained in a suitable type of holder. Withhold food from any animal used, beginning 1 hour before the first temperature reading, and permit no food until the day's record is completed. Access to water may be allowed. On the day of the test, take the control temperature prior to beginning the injection. However, a period of not more than 15 minutes should elapse, after the removal of the animal from the cage, to the time of taking the control temperature if the animal is to be restrained in a holder during the test.

Animals may be used for the test, provided the control temperature reading taken on the day of the test does not fall below 38.9° and does not exceed 39.8°. The reading taken on the day of the test constitutes the normal temperature of the test animal from which a subsequent rise following the injection of the test material is calculated. Warm the product to be tested to approximately 37° and inject intravenously, through an ear vein, 10 cc. per Kg. of rabbit, within 15 minutes subsequent to the control temperature reading on the day of the test. Record the temperature at 1 hour subsequent to the injection and each hour thereafter until three recordings have been made. Syringes and needles used for these injections must have been treated to render them pyrogen-free and then immediately sterilized. The syringes and needles may be rendered pyrogen-free by heating in a muffle furnace at 250° for not less than 30 minutes, or by any other suitable method. Three rabbits shall be used for each test and the test shall be considered positive if two or three animals show an individual rise in temperature of 0.6° or more above the normal established for each of these animals. If only one animal shows a temperature rise of 0.6° or more, or if the sum of the temperature rises of the three animals exceeds 1.4°, the test must be repeated using five rabbits. The test shall be considered positive if two or more of the group of five rabbits show an individual rise in temperature of 0.6° or more above the normal established for these animals.

The Pyrogen Test is designed for products which can be tolerated by the test rabbit in a dose of 10 cc. per Kg. For products requiring the use of test doses of less volume or for products requiring dilution, the individual monograph will specify the test dose, or the required dilution to be used.

Water for injection and other products to be tested may be rendered isotonic before testing by adding a sufficient quantity of pyrogen-free sodium chloride.

Readily Carbonizable Substances

In tests for readily carbonizable substances, unless otherwise directed, add the specified quantity of the substance, finely powdered if in solid form, in small portions to the comparison container, which is made of colorless glass resistant to the action of sulfuric acid, and containing the specified volume of sulfuric acid, which contains not less than 94.5 per cent and not more than 95.5 per cent H_2SO_4, determined by titration. Stir the mixture with a glass rod until solution is complete, allow the solution to remain at rest for 15 minutes, unless otherwise directed, and compare the color of the solution with that of the specified matching fluid in a comparison container which is also of colorless glass and has the same internal dimensions and cross-section, viewing the fluids transversely against a background of white porcelain or white glass.

When heat is directed in order to effect solution of the substance in the sulfuric acid, the sample and the acid are to be mixed in a test tube and heated as directed, and the solution then transferred to the comparison container for matching.

Preparation of the Matching Fluids—Accurately measure the prescribed volume of the colorimetric test solutions (see *Colorimetric Solutions*, page 844) and water with either burettes or pipettes, having graduations in 0.1 cc. or less, into one of the matching containers, and thoroughly mix the solutions in the container. For purposes of comparison the formulas are given below for a series of twenty matching fluids, each designated by a letter of the alphabet.

Matching Fluids	Parts of Cobaltous Chloride C.S.	Parts of Ferric Chloride C.S.	Parts of Cupric Sulfate C.S.	Parts of Water
A	0.1	0.4	0.1	4.4
B	0.3	0.9	0.3	8.5
C	0.1	0.6	0.1	4.2
D	0.3	0.6	0.4	3.7
E	0.4	1.2	0.3	3.1
F	0.3	1.2	0.0	3.5
G	0.5	1.2	0.2	3.1
H	0.2	1.5	0.0	3.3
I	0.4	2.2	0.1	2.3
J	0.4	3.5	0.1	1.0
K	0.5	4.5	0.0	0.0
L	0.8	3.8	0.1	0.3
M	0.1	2.0	0.1	2.8
N	0.0	4.9	0.1	0.0
O	0.1	4.8	0.1	0.0
P	0.2	0.4	0.1	4.3
Q	0.2	0.3	0.1	4.4
R	0.3	0.4	0.2	4.1
S	0.2	0.1	0.0	4.7
T	0.5	0.5	0.4	3.6

Reference Standards, U. S. P.

The accuracy of many modern assays, whether chemical, colorimetric, biological, or microbiological, and the uniformity of potency of many official preparations, are greatly enhanced when standard products are available for comparison.

This principle was introduced into the biological assays of digitalis, ergot, and cannabis of the U. S. P. X, and subsequently was adopted by the Permanent Commission on Biological Standardization of the Health Organization of the League of Nations. The Commission, with the assistance and supervision of the National Institute for Medical Research, in London, undertook the preparation of standards for the more important medicinal substances standardized by biological methods, and the distribution of these standards internationally as master or International Standards. National Control Centers were established in each country participating in the program, and the International Standards were made available at these centers as standards for research and for comparison in preparing similar working standards for use by manufacturers and enforcement agencies within the countries themselves. This program has been developed with marked success and efficiency throughout the years and has resulted in the general adoption throughout the world of the standards proposed by the League Commission.

In the United States the Pharmacopœial organization was selected as the National Control Center for International Standards, and assumed the responsibility for preparing and distributing similar pharmacopœial standards for use in manufacture and control. The use of U. S. P. standards has expanded through the years and the list of items now exceeds that for which International Standards have been provided.

To insure dependable U. S. P. Reference Standards, the Pharmacopœia has

organized a Reference Standards Committee which plans, supervises, and finally passes upon the analytical data presented with each lot of a standard prepared for distribution. Whenever an International Standard is available, the U. S. P. Standard is compared with this and brought as closely as possible into agreement. The Federal control officials of both the United States and Canada collaborate closely with the U. S. P. Reference Standards Committee and the supporting information surrounding each substance employed as a standard has been reviewed and oftentimes checked by these two agencies and their data placed in the records of the Committee. Finally, the approval and recommendation for release, as voted by the Reference Standards Committee, together with a review of the supporting data, is placed before the U. S. P. General Committee of Revision for acceptance, and before the Board of Trustees for authority to release.

The U. S. P. Reference Standards now available are as follows:*

Ascorbic Acid	Methyltestosterone
Calcium Pantothenate	Nicotinamide
Cholic Acid	Nicotinic Acid
Choline Chloride	Ouabain†
Diethylstilbestrol	Posterior Pituitary
Digitalis	Potato Starch
Digitoxin	Protamine
Digoxin	Pyridoxine Hydrochloride
Epinephrine	Riboflavin
Ergotoxine Ethanesulfonate	Sulfanilamide
Estrone	Thiamine Hydrochloride
Insulin	Trypsin
Lanatoside C	Vitamin A
Melting Points	Vitamin D (For the official U. S. P. rat assay)

Vitamin D. Distributed only for use in the assay for standardizing animal food by the "chick method," the assay established by the Association of Official Agricultural Chemists (see *J.A.O.A.C.*, Vol. 22, p. 81 (Feb., 1939), and "Official and Tentative Methods of Analysis of the A.O.A.C.," Sixth Edition, 1945).

Refractive Index (For Liquids)

The refractive index (n) of a transparent substance is the ratio of the velocity of light in air to its velocity in that material under like conditions. It is equal to the ratio of the sine of the angle of incidence made by a ray in air to the sine of the angle of refraction made by the ray in the material being tested. This physical constant is used as a means for identification of, and detection of impurities in, volatile oils. The Abbé refractometer measures the range of indices of the Pharmacopœial materials for which these values are given. Other refractometers of equal or greater accuracy may be employed at the discretion of the operator.

* For U. S. P. Reference Standards, Address U. S. P. Reference Standards, 4738 Kingsessing Ave., Philadelphia, 43, Pa. Price lists including unit sizes are available on request.

† Because of the difference in water content, 1.0 mg. of U. S. P. Ouabain Reference Standard is the equivalent of 1.1 mg. of official *Ouabain*, page 368.

Refractive Indexes of Some U. S. P. Crystalline Substances**

The accompanying table of significant refractive indexes and other data of some U. S. P. crystalline substances is provided for the convenience of those who wish to use these data for purposes of identification. The designation n_α, n_β and n_γ refer to significant refractive indexes, while n_i represents an intermediate refractive index, significant, but not conventional, as between n_α and n_β, or n_β and n_γ.

Substance	Crystal System	n_α	n_β or n_i	n_γ
Acetanilid	Rhombic	1.515	1.620	>1.733
Acetophenetidin*	Monoclinic	1.518	1.574	>1.733
Acetylsalicylic acid	Triclinic	1.505	1.645	1.655
Aminopyrine	....	1.520	...	1.732
Ammonium chloride	Isometric	1.643	...	...
Antimony potassium tartrate	Rhombic	1.620	1.636	1.638
Arsenic trioxide	Isometric	1.755	...	...
Ascorbic acid	....	1.483	1.605	>1.695
Atropine	Rhombic	1.550	...	1.595
Barbital†	....	1.445	1.548	1.580
Barbital sodium	....	1.512	...	1.615
Barium sulfate	Rhombic	1.637	1.638	1.649
Benzoic acid	Monoclinic	1.616 (common n)		...
Betanaphthol	Monoclinic	1.523	...	1.733
Boric acid	Triclinic	1.340	1.456	1.459
Caffeine‡	....	1.455	1.472(n_i)	1.733
Calcium carbonate§	Trigonal			
Calcium lactate	....	1.470	...	1.510
Chloral hydrate	Monoclinic	1.538	1.600	1.602
Citric acid	Rhombic	1.493	1.498	1.509
Cocaine hydrochloride	Rhombic	1.570	1.596	1.618
Codeine sulfate	Rhombic	1.561	1.642	1.661
Cupric sulfate	Triclinic	1.514	1.537	1.543
Dextrose	Monoclinic	1.521	...	1.549
Ephedrine hydrochloride	....	1.530	1.603	1.638
Ephedrine sulfate	....	1.540	1.565	1.590
Epinephrine	....	1.555	...	1.733
Ergotamine tartrate	....	1.518	...	1.625
Estradiol benzoate	....	1.586	...	1.632
Estrone	Monoclinic	1.520	1.642	1.692
Eucatropine hydrochloride	....	1.560	...	1.610
Ferrous sulfate	Monoclinic	1.471	1.478	1.485

* Dimorphic.
† May exist in different phases.
‡ Effloresces in dry air.
§ n_ϵ = 1.486; n_ω = 1.658.
** For further information see "Microscopic Identification of Crystalline Substances in U. S. P. XII" by George L. Keenan, *J. Assoc. Official Agr. Chem.*, Vol. 27, pp. 153–161 (1944).

Substance	Crystal System	n_α	n_β or n_i	n_γ
Homatropine hydrobromide	....	1.603	1.610(n_i)	1.645
Lactose	Monoclinic	1.517	1.542	1.550
Magnesium sulfate	Rhombic	1.433	1.455	1.461
Methenamine	....	1.590 (singly refracting)		
Methylben	Monoclinic	1.585	1.689	1.700
Morphine sulfate	Rhombic	1.545	1.620	1.632
Mercury bichloride	Rhombic	1.725	1.859	1.965
Nicotinic acid	....	1.428	1.733(n_i)	...
Neostigmine bromide	....	1.560	1.658	1.675
Neostigmine methylsulfate	....	1.519	1.525	1.580
Nicotinamide	....	1.485	1.734(n_i)	>1.733
Papaverine hydrochloride	....	1.555	1.734	>1.734
Pentobarbital sodium	....	1.477	...	1.523
Phenacaine hydrochloride	....	1.518	1.603	1.733
Phenobarbital*	....	1.557	1.620	1.667
Phenolphthalein	Triclinic	1.635	...	1.673
Pilocarpine nitrate	....	1.475	1.588	1.608
Potassium alum	Isometric	1.450	...	...
Potassium bicarbonate	Monoclinic	1.380	1.482	1.578
Potassium bitartrate	....	1.510	...	1.590
Potassium bromide	Isometric	1.559	...	...
Potassium chloride	Isometric	1.490	...	...
Potassium iodide	Isometric	1.667	...	...
Potassium sodium tartrate	Rhombic	1.492	1.493	1.496
Procaine hydrochloride	....	1.540	1.556	>1.690
Quinacrine hydrochloride	....	1.522	1.733(n_i)	>1.733
Quinidine sulfate	....	1.565	1.607	1.670
Quinine bisulfate	....	1.555	...	1.620
Quinine hydrochloride	....	1.588	1.615	1.656
Quinine sulfate	....	1.595	1.635	1.690
Saccharin	Monoclinic	1.535	1.690	>1.733
Saccharin sodium	....	1.560	1.642	1.733
Silver nitrate	Rhombic	1.729	...	1.788
Sodium benzoate	....	1.490	...	1.680
Sodium bicarbonate	Monoclinic	1.380	1.500	1.586
Sodium borate	Monoclinic	1.447	1.470	1.472
Sodium bromide	Isometric	1.641	...	...
Sodium carbonate, monohyd.	Rhombic	1.420	1.509	1.525
Sodium chloride	Isometric	1.544	...	...
Sodium citrate	Monoclinic	1.470	1.500	1.510
Sodium iodide	Isometric	1.775	...	...
Sodium salicylate	....	1.421	1.445(n_i)	1.678
Sodium sulfate	Monoclinic	1.394	1.396	1.398

* May exist in three crystal phases.

Substance	Crystal System	n_α	n_β or n_i	n_γ
Strychnine sulfate	Monoclinic	1.592	1.597	1.661
Sucrose	Monoclinic	1.540	1.567	1.572
Sulfanilamide	....	1.570	1.677(n_i)	>1.733
Sulfapyridine	....	1.680	1.733	>1.733
Sulfapyridine sodium	....	1.590	...	1.700
Sulfathiazole	....	1.674	1.685	>1.733 (plates)
Sulfathiazole	....	1.605	1.733	>1.733 (rods)
Talc	Monoclinic	1 539	1.589	1.589
Tartaric acid	Monoclinic	1.495	1.536	1.605
Tetracaine hydrochloride	....	1 488	1.733(n_i)	>1.733
Theophylline	....	1 447	1 695(n_i)	>1 733
Urea*	Tetragonal			

* n_ϵ = 1.602, n_ω = 1.484.

Residue on Ignition or Non-Volatile Matter in Chemicals

Weigh accurately from 1 to 2 Gm., or the amount of the chemical directed in the monograph, in a tared crucible of platinum, porcelain, or other suitable material. Ignite until thoroughly charred, cool, then, unless otherwise directed in the monograph, moisten the residue with 1 cc. of sulfuric acid, and cautiously ignite until the carbon is completely consumed. Conduct the ignition in a place protected from air currents, and use as low a temperature as possible to effect the combustion of the carbon. When the carbon has completely disappeared, cool the crucible in a desiccator, and weigh.

To test for non-volatile matter in volatile inorganic chemicals, proceed as directed in the preceding paragraph, using the lowest effective temperature.

Riboflavin Assay

Microbiological Method

Test Solution of the Material to be Assayed—Conduct the following operations at all stages of the process so that the solutions are protected, as far as possible, from light, which destroys riboflavin.

Place an accurately weighed quantity of the material to be assayed, sufficient to represent approximately 0.2 mg. of riboflavin, in a 1000-cc. flask, add 400 cc. of tenth-normal hydrochloric acid, and mix thoroughly. Heat the mixture in an autoclave at 15 pounds pressure (121.5°) for 30 minutes, cool, add sufficient sodium hydroxide T.S. to produce a pH of 4.5, add sufficient water to make 1000 cc., and filter through quantitative filter paper which is known not to adsorb riboflavin. To a 100-cc. aliquot of the clear filtrate add sodium hydroxide T.S. to produce a pH of 6.8, and sufficient water to make 200 cc.; filter, if necessary, to obtain a clear solution.

Standard Riboflavin Solution—Dissolve 25 mg of U. S. P. Riboflavin Reference Standard, accurately weighed, in sufficient dilute acetic acid (10 cc. of diluted acetic acid to 500 cc. of water) to make 500 cc. Preserve this stock solution protected from light, and under toluene, in a refrigerator. Prepare the standard solution by diluting 2 cc. of the stock solution with sufficient water to make 1000 cc., representing 0.1 microgram of U. S. P. Riboflavin Reference Standard in each cc. Prepare fresh Standard Solution for each assay.

Basal Medium Stock Solution—

Photolyzed Peptone Solution	50 cc.
Cystine Solution	50 cc.
Yeast Supplement Solution	5 cc.
Dextrose	16.5 Gm.
Salt Solution A	2.5 cc.
Salt Solution B	2.5 cc.

Dissolve the dextrose in the solutions which have been previously mixed, and, if necessary, adjust to a pH of 6.8, using sodium hydroxide T.S. Finally add sufficient water to make 250 cc. of solution.

Photolyzed Peptone Solution—Dissolve 40 Gm. of peptone in 250 cc. of water, and 20 Gm. of sodium hydroxide in 250 cc. of water, and mix the solutions in a crystallizing dish having a diameter of about 25 cm. At a distance of about 1 foot from the dish place a 100-watt bulb fitted with a reflector, and expose the solution to light from the bulb for 6 to 10 hours, then allow the mixture to stand for the remainder of a 24-hour period. Maintain the solution during this treatment at a temperature not exceeding 25°. Neutralize the sodium hydroxide with glacial acetic acid, and add 7 Gm. of anhydrous sodium acetate and sufficient water to make the solution measure 800 cc. Preserve the solution under toluene in a refrigerator.

Cystine Solution—Dissolve 1 Gm. of *l*-cystine in 20 cc. of 10 per cent hydrochloric acid and add sufficient water to make the solution measure 1000 cc. Store the solution under toluene in a refrigerator at a temperature not below 10°.

Yeast Extract Solution—Heat a mixture of 500 Gm. of fresh baker's yeast (starch-free) and 5 liters of water in flowing steam for 2 hours, then autoclave it at 15 pounds pressure (121.5°) for 40 minutes. Allow the mixture to settle. filter, and evaporate the filtrate to a volume of 125 cc., under reduced pressure, at a temperature not exceeding 50°.

Yeast Supplement Solution—Add 125 cc. of a solution containing 38 Gm. of lead subacetate to 125 cc. of the yeast extract solution. Filter, and add ammonia T.S. to the filtrate to produce a pH of approximately 10. Filter, and add glacial acetic acid to the filtrate to produce a pH of 6.5. Precipitate the excess lead with hydrogen sulfide, filter, and add sufficient water to the filtrate to make 250 cc. Preserve the solution under toluene in a refrigerator.

Salt Solution A—Dissolve 25 Gm. of monobasic potassium phosphate and 25 Gm. of dibasic potassium phosphate in sufficient water to make 250 cc. of solution.

Salt Solution B—Dissolve 10 Gm. of magnesium sulfate, 0.5 Gm. of sodium

chloride, 0.5 Gm. of ferrous sulfate, and 0.5 Gm. of manganese sulfate in sufficient water to make 250 cc.

Stock Culture of Lactobacillus casei—To 10 cc. of yeast extract solution in 90 cc. of water add 1 Gm. of anhydrous dextrose and 1.5 Gm. of agar, and heat the mixture on a steam bath until the agar has dissolved. Add approximately 10-cc. portions of the hot solution to test tubes, plug the tubes with non-absorbent cotton, sterilize in an autoclave at 15 pounds pressure (121.5°) for 20 minutes, and allow to cool in an upright position. Prepare stab cultures in 3 or more of the tubes, using a pure culture of *Lactobacillus casei*,* incubate for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ±0.5°, and finally store in a refrigerator. Prepare a fresh stab of the stock culture every week, and do not use for inoculum if the culture is more than 2 weeks old.

Culture Medium—To each of a series of tubes containing 5 cc. of the basal medium stock solution add 5 cc. of water containing 1 microgram of riboflavin. Sterilize in an autoclave at 15 pounds pressure (121.5°) for 20 minutes.

Inoculum—Make a transfer of cells from the stock culture of *Lactobacillus casei* to a sterile tube containing 10 cc. of culture medium. Incubate this culture for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ±0.5°. Under aseptic conditions centrifuge the culture and decant the supernatant liquid. The inoculum is prepared by suspending the cells from the culture in 10 cc. of sterile isotonic sodium chloride solution. If assays are to be made on each of several successive days, the inoculum may be prepared by successive daily transfers to the culture medium for a period not exceeding 1 week.

Assay Procedure—Prepare standard riboflavin tubes as follows: To duplicate tubes, 16 × 150 mm. in size, add 0.0 cc., 0.5 cc., 1.0 cc., 1.5 cc., 2.0 cc., 2.5 cc., 3.0 cc., and 5.0 cc., respectively, of the standard riboflavin solution. To each of these tubes add 5 cc. of basal medium stock solution and sufficient water to bring the volume in each tube to 10 cc.

Prepare tubes containing the material to be assayed as follows: To duplicate tubes add, respectively, 0.5 cc., 1.0 cc., 1.5 cc., and 2.0 cc. of the test solution of the material to be assayed. To each of these tubes add 5 cc. of basal medium stock solution and sufficient water to bring the volume in each tube to 10 cc.

After mixing thoroughly, plug the tubes of the two series mentioned above with non-absorbent cotton and autoclave at 15 pounds pressure (121.5°) for 20 minutes. Cool, aseptically inoculate each tube with 1 drop of inoculum and incubate for 72 hours at any selected temperature between 30° and 37° but held constant to within ±0.5°. Contamination of the assay tubes with any organism other than *Lactobacillus casei* invalidates the assay. Keep all of the tubes in darkness or semidarkness during their preparation and incubation.

Transfer the contents of each tube to a suitable container, using approximately the same quantity of water in each instance for rinsing. Titrate the contents of each flask with tenth-normal sodium hydroxide, using bromothymol blue T.S. as the indicator, or to a pH of 6.8 measured electrometrically.

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* Pure cultures of *Lactobacillus casei* may be obtained from the American Type Culture Collections, Georgetown University Medical School, Washington, D. C., as number 7469.

Calculation—Prepare a standard curve of the riboflavin standard titrations by plotting the average of the titration values expressed in cc. of tenth-normal sodium hydroxide for each level of the riboflavin standard solution used, against micrograms of riboflavin contained in the respective tubes. From this standard curve determine by interpolation the riboflavin content of the test solution in each tube. Discard any values which show more than 0.25 or less than 0.05 microgram of riboflavin in each tube. Calculate the riboflavin content in each cc. of test solution for each of the tubes. The riboflavin content of the test material is calculated from the average of the values obtained from not less than 6 of these tubes which do not vary by more than ±10 per cent from the average. If the titration values of less than 6 of the tubes containing the test solution are within the range of the titration values of the riboflavin standard tubes containing 0.05 to 0.25 microgram of riboflavin, the data are insufficient to permit calculation of the riboflavin content of the test material. Titration values exceeding 2 cc. for the tubes of the standard riboflavin solution series containing 0.0 cc. of the solution indicate the presence of an excessive amount of riboflavin in the basal medium stock solution and invalidate the assay.

Rosin Test

In testing for rosin as an adulterant in resins, gum resins, and balsams, unless otherwise directed, place in a small mortar 1 Gm. of the substance, powdered or crushed if necessary, and add 10 cc. of petroleum benzin. Triturate well for 1 or 2 minutes, filter into a test tube, and add to the filtrate 10 cc. of a fresh solution of cupric acetate (1 in 200). Shake well and allow the liquids to separate: the benzin layer should not show a green color.

Solubilities

Pharmacopœial chemicals, when brought into solution, may show slight mechanical impurities, such as fragments of filter paper, fibers, and dust particles, unless excluded by definite tests in the individual monograph. When the exact solubility of a pharmacopœial substance is not known, a descriptive term is used to indicate its solubility. The following table indicates the meanings of such terms:

Descriptive Terms	*Relative quantities of solvent for 1 part of solute*
Very soluble	Less than 1 part
Freely soluble	From 1 to 10 parts
Soluble	From 10 to 30 parts
Sparingly soluble	From 30 to 100 parts
Slightly soluble	From 100 to 1000 parts
Very slightly soluble	From 1000 to 10,000 parts
Practically insoluble	More than 10,000 parts

Sterility Tests for Liquids and Solids

When a test for the sterility of a liquid or a solid is prescribed, the following procedures shall be used:

Sterility Test Media

I. Fluid Thioglycollate Medium

l-Cystine	0.75 Gm.
Agar, granulated (moisture content not in excess of 15 per cent)	0.75 Gm.
Sodium Chloride	2.5 Gm.
Dextrose	5.5 Gm.
Water-soluble Yeast Extract	5.0 Gm.
Pancreatic Digest of Casein	15.0 Gm.
Sodium Thioglycollate	0.5 Gm.
or Thioglycollic Acid	0.3 cc.
Resazurin Sodium Solution, 0.1 per cent, freshly prepared	1.0 cc.
Distilled Water	1000 cc.

Mix the *l*-cystine, agar, sodium chloride, dextrose, water-soluble yeast extract, and pancreatic digest of casein with 1000 cc. of distilled water, and heat on a water bath until solution is effected. Dissolve the sodium thioglycollate or thioglycollic acid in the solution, and, if necessary, adjust the solution with normal sodium hydroxide so that, after sterilization, it will have a pH of 7.1 ± 0.1. If filtration is necessary, reheat the solution without boiling, and filter through moistened filter paper. Add the resazurin solution, mix thoroughly, place the medium in culture tubes, and sterilize in an autoclave at 121.5° (15 pounds pressure) for 20 minutes. Cool at once to 25°, and store the medium, preferably between 20° and 30°, protected from light.

Note—Do not use this medium if evaporated to an extent affecting its fluidity or if more than the upper one-third has changed to a pink color. However, one reheating on a water bath, until the pink color disappears, is permitted.

II. Alternate Fluid Medium for Sterility Tests

l-Cystine	0.05 Gm.
Sodium Chloride	2.5 Gm.
Dextrose	1.1 Gm.
Water-soluble Yeast Extract	5.0 Gm.
Pancreatic Digest of Casein	15.0 Gm.
Sodium Thioglycollate	0.5 Gm.
or Thioglycollic Acid	0.3 cc.
Distilled Water	1000 cc.

Heat the ingredients in a suitable container on a water bath until solution is effected. Mix thoroughly, and, if necessary, adjust the solution with normal sodium hydroxide so that, after sterilization, it will have a pH of 7.1 ± 0.1. Filter, if

necessary, place in Smith fermentation tubes, and sterilize in an autoclave at 121.5° (15 pounds pressure) for 20 minutes.

Note—Certain products are turbid or otherwise unsuitable for culturing a fluid thioglycollate medium (medium I) because of its viscosity. The above medium (medium II) is acceptable in place of fluid thioglycollate medium (medium I), provided it is used in Smith fermentation tubes, and heated prior to use in a boiling water bath so as to drive the dissolved oxygen out of the medium in the closed arm.

III. Honey Medium for Molds and Yeasts

Pancreatic Digest of Casein	10 Gm.
Honey	60 cc.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Dissolve the pancreatic digest of casein in the distilled water with gentle heat, add the honey, and, if necessary, adjust the reaction to a pH of 6.0. Filter, if necessary, place in culture tubes, and sterilize at 121.5° (15 pounds pressure) for 20 minutes. The final reaction should approximate a pH of 5.6.

Note—Dehydrated media are available commercially for the preparation of culture media. If these are used for the preparation of official culture media, they shall yield products conforming to those that are official.

Suggested Technique for Conducting Tests for Sterility

All bacteriological tests shall be conducted by trained workers under the most rigid aseptic precautions. It is desirable that all manipulations be conducted in a dustproof room supplied with filtered air under positive pressure; other suitable means may be used for eliminating air contamination.

Procedure for Testing Liquids

Opening Containers—Immerse all glass ampuls in alcohol, or wipe them with alcohol, to remove dust particles. With the aid of sterile forceps, flame the ampul adequately, but avoid heating the contents. Open the ampul, using a sterile file.

In the case of containers closed with rubber caps or other closures, remove dust particles from the closure and from the neck of each container with sterile cotton saturated with alcohol, and treat adequately with iodine tincture or with other suitable means. If the liquid in the container is under vacuum, admit sterile air into the container by means of suitable sterile equipment such as a syringe needle attached to a syringe barrel filled with non-absorbent cotton.

Removing and Culturing Contents—Remove the contents for culturing with a sterile pipette. If necessary, the contents may be removed with a sterile syringe and needle. Sterilize pipettes, syringes, and needles preferably by Process B, page 693.

In testing preparations in their final containers, plant one or more tubes of fluid thioglycollate medium with portions of the liquid from each container being tested. The amount of inoculum and the volume of medium shall be varied according to the volume of liquid being tested, as follows:

Content of Container	*Minimum Volume of Inoculum*	*Volume of Medium*
Less than 20 cc.	1 cc.	15 cc.
From 20 cc. to 50 cc.	5 cc.	40 cc.
More than 50 cc.	10 cc.	40 cc.

For 15 cc. of medium use tubes preferably 20 × 150 mm., and for 40 cc. of medium, use tubes preferably 25 × 200 mm.

Liquids which are inherently bacteriostatic, or contain bacteriostatic agents, shall be treated with a suitable, sterile, inactivating agent, or diluted beyond the bacteriostatic level by planting in a greater volume of culture medium, so that growth will not be inhibited.

Mix the liquid thoroughly with the medium. If the test material is an oil, shake the mixture vigorously to disperse the oil in the medium at the time of planting and at frequent intervals during the incubation period.

Make final readings for sterility after not less than 7 days of incubation at 37°. When the liquid to be tested renders the medium turbid so that final interpretation of growth cannot be made at the end of 7 days, confirm the presence or absence of growth by microscopic examination of stained smears, or make transfers from the tubes originally planted to tubes of fresh medium, and incubate these tubes at 37° for not less than 3 days.

Incubate cultures of material in honey medium for molds and yeasts at 22° to 25° for 15 days. Confirm cultures showing macroscopic growth by a microscopic examination of stained smears.

When the liquid in final containers is tested, representative samples consisting of not less than 3 per cent of the total number shall be tested, but the number need not exceed ten containers from any one lot.

When the liquid in bulk containers for repackaging or manufacturing purposes is tested, plant one or more tubes of medium, employing a total of at least 10 cc. of liquid from each container.

If the liquid under test is found to be contaminated, discard it, or treat it in such a manner as to render it free from living microörganisms.

Procedure for Testing Solids

Opening Packages and Containers—For purified cotton, gauze, surgical dressings, and related products, flame, with care, the immediate carton, package, container, or one of the margins, if an envelope. For sutures, make a file line in the center of the suture tube, or about 10 mm. above the tubing fluid, place the tubes in a suitable, effective disinfectant solution for 24 hours, remove with sterile forceps, and place them between sterile towels. As an alternative method of sterilization, flame the tubes, preferably in a wing flame, but avoid heating the contents. Break the tube at the filed line, preferably by holding a red-hot, curved wire against it. For crystalline or powdered solids, proceed as directed for *Opening Containers* under *Procedure for Testing Liquids*, page 690.

Removing and Culturing Contents—From each carton, package, and similar container, remove, with sterile forceps, and with sterile scissors, if needed, duplicate or triplicate portions of the material to be tested, from various locations within the

roll of purified cotton, gauze, surgical dressing, or related material, preferably from the outer end, the center, and the core. Sterilize the forceps and the scissors by Process B, or by Process C, see *Sterilization Processes*, page 692. Flame the forceps and the scissors thoroughly between successive transfers. Each portion of purified cotton shall weigh approximately 0.25 Gm., and each portion of gauze and related material shall be approximately 3 square inches in area. Transfer these portions of the material, as rapidly as possible, to the necessary number of tubes, each containing 40 cc. of fluid thioglycollate medium, and also transfer portions to tubes of honey medium for molds and yeasts. Transfer entire sutures to culture tubes each containing 40 cc. of fluid thioglycollate medium, and to culture tubes containing 40 cc. of honey medium for molds and yeasts.

Adhesive absorbent gauze, sutures, or other solids which are inherently bacteriostatic, or contain bacteriostatic agents, shall be treated with a suitable, sterile, inactivating agent, or brought beyond the bacteriostatic level by planting in a greater volume of culture medium, so that growth will not be inhibited.

Incubate cultures of sutures at 37° for 15 days before negative results are recorded. Incubate other solids at 37° for 7 days before negative results are recorded. Incubate cultures of materials in honey medium for molds and yeasts at 22° to 25° for 15 days. Confirm cultures showing macroscopic growth by a microscopic examination of stained smears.

If the product under test may be bacteriostatic when cultured as directed above, inoculate at least 5 per cent of all negative tubes of medium I or II with 1 cc. of a 1 to 100,000 dilution of an 18- to 24-hour broth culture of *Clostridium novyi*, and incubate at 37° for 3 days. In a similar manner inoculate 5 per cent of all negative tubes of medium I or II with 1 cc. of a 1 to 100,000 dilution of an 18- to 24-hour broth culture of *Escherichia coli*, and incubate at 37° for 3 days. Also inoculate 5 per cent of all negative tubes of honey medium for molds and yeasts with 1 cc. of a 1 to 1000 dilution of a 72-hour honey medium culture of *Monilia albicans*, and incubate at 22° to 25° for 3 days. Failure of growth is evidence that bacteriostatic or fungistatic agents carried over in the test material may be responsible for the negative results.

Controls

Prepare the following controls simultaneously when testing any material for sterility:

a. Test each lot of medium I or of medium II for its growth-promoting and oxidation-reduction qualities, using one or more bacteria that are exacting in their growth requirements. At the end of the incubation period used for the sterility test, less than 60 per cent of the medium in the tube shall have changed color.

b. Confirm the sterility of each lot of sterilized test medium used in sterility tests.

Sterilization Processes

"Sterilization" refers to the destruction of all living organisms and their spores in, or their removal from, materials. This may be accomplished in various ways

Cleansing—Preparatory to sterilization, all containers, especially glassware and stoppers, must be thoroughly cleansed by a suitable method. Boiling for not less

than 10 minutes in water to which a suitable soap or detergent has been added, followed by rinsing in water and another boiling in from 0.1 per cent to 0.3 per cent HCl or HNO_3 is advocated. When necessary, special cleaning fluids are used to remove organic matter not affected by previous washing. Thorough rinsing with water, followed by freshly distilled water, is practiced as the final treatment in all instances. It is important to see that each container is filled with the various solutions during the washing treatment as well as with water during the rinsings.

The methods of sterilization most frequently employed for empty containers, apparatus, and materials used in the manufacture of preparations for injection, and for sterilizing and preparing the latter, are as follows:

Process A—

Direct Flame—The usefulness of a direct flame is limited to those products which are not injured or adversely affected by the application of a flame, such as the Bunsen flame. Platinum, nichrome, and other metallic needles and wires, iron and nickel spatulas, tweezers and forceps are quickly sterilized by heating to redness in a Bunsen or alcohol flame. Slabs, mortars and one-piece pestles, stoneware, metallic orifices of bacteria-proof filters, or any metallic ware may, in emergencies, be sterilized in the direct flame of a Bunsen burner, provided that the application of such direct flame is for a period of not less than 20 seconds to each part thus treated. Care must be taken to be assured that the article to be treated will not be broken or injured by this technique. Though slides and cover-slips, glass rods and the lips of tubes, bottles and flasks may be sterilized by passing them through a flame for the period of time previously mentioned, such procedure is not recommended for glassware, as there is always the possibility of breaking the latter by heating in a direct flame. Other safe methods described below should be used. However, if a small number of ampuls are needed as containers for a preparation to be dispensed quickly, such ampuls, if not already sterile, can be sterilized, in an emergency, in the direct flame, using care and supporting them (neck-downward) in the meshes of a wire basket until cool, when they are to be filled immediately and quickly sealed.

Process B—

Dry Heat—Dry or hot-air heat has a limited use. However, exposure to dry heat in a suitable hot-air sterilizer or oven is the usual procedure for sterilizing all empty glass, porcelain and metallic containers which are *to be kept on hand for future use*. Such containers can readily be sterilized in an autoclave and this technique should be used if they are required for immediate use or need not be dry. Containers made of heavy or thick glass are best sterilized in the autoclave. All materials sterilized by dry heat (hot-air) must be thoroughly clean and free from traces of organic matter. To insure sterilization of materials by this method, they should be exposed to a temperature not below 170°, preferably for 2 hours, but never for less than 1 hour. To avoid the cracking of glassware, both heating and subsequent cooling in this and other heating sterilization processes should be done gradually. A thermo-regulating valve may be used but a recording thermometer must be present on the sterilizer. All objects sterilized by this or any other process should be suitably wrapped or protected so that they remain sterile. Non-absorbent cotton plugs or other suitable stoppers in flasks and other containers must be wrapped on the outside

with a piece of metallic foil or with a layer of gauze or muslin, or covered with stout paper and secured with cord around the neck of the container. Adequate attention must be given to the preparation of the materials to be sterilized in a hot-air oven as well as to the details of loading this and other types of sterilizers used in the different sterilization processes. All materials should be distributed and arranged loosely in the chamber or in other sterilizers. Avoid tight packing. In sterilizing combustible articles in a hot-air chamber, it should be remembered that cotton and paper are browned at 190° and over. Apparatus or material not stoppered or wrapped with inflammable coverings, as Petri dishes, pipettes and ampuls (placed in metallic containers), and jars stoppered with metallic or enamel tops can be sterilized at a temperature of 200° or higher and for at least 45 minutes.

Substances, as glycerin, liquid petrolatum, oils, oily solutions and suspensions, fats and powders, which resist penetration by moist heat, may be more conveniently sterilized in a hot-air oven, where a prolonged uniform temperature can be obtained. Oily solutions or suspensions, oils, ointment vehicles, and powders in covered Petri dishes (in strata not more than ¼ inch in thickness) which are not decomposed or otherwise affected by the treatment, are sterilized at a temperature of at least 170° to 180° for not less than 1 hour, care being taken that the *entire contents* in each container is maintained at this temperature for the designated time period. For medicaments, as sulfanilamide, which are decomposed at high temperatures, a lower temperature for a more prolonged period (140° for 4 hours) may be used.

Process C—

Steam under Pressure (Heating in an Autoclave)—The use of steam under pressure makes available moist heat at temperatures higher than that obtainable by boiling water under normal pressure. By this means, spores as well as vegetative forms of bacteria are destroyed by one short exposure. It is the most satisfactory method of heat sterilization available. It is the method which is to be used for sterilizing preparations for injection and is applicable to the sterilization of any material or object which is not injured by moisture and the high temperature employed, and which can be conveniently placed in the apparatus at hand. The steam pressure kettle may be used for small-scale operations. In the laboratory, the device most commonly used is the autoclave. Steam pressure sterilizers intended for the sterilization and drying of surgical material, dressings, and other hospital equipment are constructed in different shapes and sizes, in various designs and types, and of different kinds of material. The successful use of an autoclave or steam sterilizer depends upon its proper operation. Skill and experience on the part of the operator are required. Adequate attention must be given to the preparation of the materials to be sterilized as well as to the details of loading. It is advisable to remove all the air possible by a preliminary vacuum by reducing the pressure to 250 mm. (10 inches) of mercury for 15 minutes, and provision should be made for the escape of the residual air from the bottom of the chamber during the process of sterilization. Where a preliminary vacuum is not used, the exposure should be prolonged for at least twice the period of time given below. Heating a mixture of steam and air under pressure will yield a lower temperature than is attained by steam alone generated under like pressure. Furthermore, air pockets prevent diffusion of the steam and the latter may not reach infected objects and materials. All autoclaves should be

equipped with thermometers, located in the exhaust line and at the lowest point in the sterilizer. The temperature actually attained is more reliable than pounds of pressure recorded. Exposure to saturated steam under 15 pounds of pressure at 121.5° for at least 20 minutes in an autoclave properly loaded and operated will destroy all living organisms including spores. A higher pressure for the same period of time or a longer exposure at the pressure mentioned is to be used, depending upon the load in the autoclave. Time must be allowed for the steam to penetrate to the center of the material or substance to be sterilized. The usual steam pressures employed, the corresponding temperatures attained, and the necessary periods of time required, after reaching the indicated temperature, to assure adequate sterilization are·

10 pounds pressure (115.5°) for 30 minutes
15 pounds pressure (121.5°) for 20 minutes
20 pounds pressure (126.5°) for 15 minutes

Process D—

1. **Free-Flowing Steam (Moist Heat at 100°)**—Exposure to live or free-flowing steam (100°) yields results similar to those obtained with boiling water. At high altitudes where the atmospheric pressure is less than at sea level, the temperature at which water boils and that of free flowing steam is below 100°. In industries on a large scale where large quantities of live steam are available, the latter is used for destroying the vegetative forms of bacteria in tanks, refrigerators, and other containers.

Free-flowing steam (under atmospheric pressure) is used extensively in the laboratories. Different types of equipment have been designed to utilize the moist heat of free-flowing steam. False bottoms placed in covered buckets or wash boilers provide apparatus useful as steam sterilizers. The Arnold sterilizer, however, is the type most frequently employed. The steam in the latter can be used continuously or intermittently. One prolonged exposure to steam (at 100°) may be employed; and this can replace the boiling water bath. In practice, the *intermittent, fractional, interrupted,* or *discontinuous* method of sterilization, also known as Tyndallization, is used most frequently with the Arnold sterilizer. In this procedure, the material is exposed to free-flowing steam (at 100°) for periods of time varying from 30 to 60 minutes on each of at least three consecutive days. During intervals between heating in all fractional methods of moist-heat sterilization, materials should be kept either at room temperature or in an incubator at body temperature. This method of sterilization is not to replace autoclaving or the use of steam under pressure if either of the latter is suitable. In noting the time of exposure in this or any other sterilizing technique, note the time after the entire contents in the containers have reached the required temperature and keep the materials at this temperature for the designated length of time. Allow the sterilizer to cool before removing the contents.

2. **Boiling Water**—Instruments, hypodermic needles, catheters, syringes, rubber tubing, and stoppers may be sterilized by boiling in water. The water should submerge the materials or be above the level of the fluid to be sterilized. Boiling is to be continued for at least 15 minutes. The addition of 1 to 2 per cent of sodium carbonate or 5 per cent phenol or 2 to 3 per cent saponated cresol solution will increase the sterilizing efficiency of the boiling water bath.

Solutions which are not adversely affected by a temperature of 100° but which are affected by higher temperatures, and which are in sealed sterile containers may be sterilized in a bath of boiling water if a steam sterilizer is not available. Exposure of the entire contents from 30 to 60 minutes at 100°, on each of three consecutive days, is required. During intervals between heating, keep at room temperature or in an incubator at body temperature.

If time does not permit more than one heating period, and fractional sterilization is required or applicable as in an emergency when preparations are prepared extemporaneously, heating for at least one period should be conducted. One heating at 100° for 30 minutes in a steam sterilizer with a bacteriostatic agent added to the preparation should be carried out.

Process E—

Fractional Moist-Heat Sterilization at Low Temperatures (Inspissation)—Materials which are injured by a temperature of 100° or higher are treated in the manner described in Process D-1, except that the temperature in the water bath or inspissator is maintained at the highest temperature which the substances being treated can bear without being decomposed or altered. Usually this is between 60° and 80°. Frequently the fractional heating is extended over a period of from 4 to 7 days. Medicinal preparations treated by this method shall contain an added bacteriostatic agent, unless the ingredients possess bacteriostatic properties. The added bacteriostatic agent must be in a concentration which will prevent the growth of all microörganisms in the materials.

This process is not a safe method of sterilization. Process F is to be used in its place wherever applicable.

Process F—

Bacteriological Filtration—This term is employed to indicate a bacteria-free filtrate in contrast to other methods of filtration in which the resultant product is not necessarily sterile. This method is employed for sterilizing those liquids in which the active agents are soluble and which in many instances are injured by heat. Bacteriological filters used to obtain bacteria-free filtrates are made of porcelain, diatomaceous earth, asbestos, sintered glass, and other materials. They are available in different sizes and in different degrees of porosity. Some forms of apparatus are fitted with suitable filtering pads or disks or membranes. The pads or disks, also available in various degrees of porosity, are used only once and then discarded. The other types of filters are tested at frequent intervals to determine their efficiency. Suction or pressure is usually employed to force liquids through these filters.

New filters should be cleansed, sterilized, and tested for impermeability to bacteria with a broth culture of a suitable microörganism. Thereafter, each time before the filter is used, it is to be examined for flaws and the entire filter apparatus and attachments, including the receiving vessels, are to be cleansed and sterilized by a suitable method, preferably by Process C. The liquid to be filtered should first be either centrifuged or filtered, if necessary, through paper pulp or a fine filter paper to remove visible suspended particles and to reduce clogging. After use, bacteriological filters should be cleansed immediately, and then sterilized. Liquid petrolatum and other oils are not to be sterilized by this method as they may increase the permeability

of the filter to bacteria. This process is exceedingly complicated. It is not a simple mechanical procedure governed only by the relative size of the pores of the filter and of the particles to be filtered, but a consideration of many factors is involved. The most important are: the composition and electrical charge of the filter; the pH and electric charge of the material being filtered; the adsorption of protein and other substances; the temperature, pressure, and the duration of the procedure.

Bacteriological filtration may not function perfectly under all conditions. It is important to determine in all instances that solutions thus treated have been rendered sterile and not otherwise altered. Medicinal preparations treated by this method shall contain a bacteriostatic agent unless otherwise directed in an individual monograph.

When preparations in bulk for injection are sterilized by this process, the distribution, filling, and sealing in the final containers must be conducted under strictly aseptic conditions.

Process G—

Oil Bath—Surgical and other instruments can be sterilized by boiling in a light mineral oil or other suitable liquid. The oil can be used repeatedly. A temperature of 160° for 60 or more minutes is employed. By this method, injury to the finish and the cutting edge of instruments is avoided.

Aseptic Manipulation—Preparations which would be decomposed or otherwise injured by the regular processes of sterilization, or preparations which are required to be prepared in an emergency, may be prepared by aseptic manipulation. By this procedure all apparatus and equipment to be used is previously sterilized, and all ingredients which will withstand sterilization are also sterilized, the final preparation then being made, using every possible precaution to maintain ultimate sterility of the finished product.

This procedure is to be used only when the regular processes of sterilization are not applicable, and the label is to indicate the date when prepared and the notation: "Prepared by aseptic manipulation."

Containers, bottles, ointment jars, collapsible metal tubes, graduates, pipettes, spatulas, glass rods, and similar equipment are cleansed and sterilized by Process B or Process C. Packs of filter paper wrapped in paper or placed in covered dishes or jars, powders (not decomposed by high temperatures) placed in covered dishes or jars, in strata not more than ¼ inch in thickness, fixed oils, liquid petrolatum, ointment vehicles, glycerin, cotton, and funnels are sterilized by Process B. Cork and rubber stoppers are placed in suitable containers, and sterilized by Process C. Ingredients, previously sterilized if possible, are weighed on sterile watch glasses or on sterile paper. The actual compounding should be conducted within a restricted area preferably under a cover and in such a manner that contamination will not occur. A bacteriostatic agent shall be added in all instances, unless otherwise directed in an individual monograph.

Note on Sterilizing by Heating Processes

If the volume of the solution in each container exceeds 10 cc. or if dry materials are present in amounts exceeding 2 Gm., it is important to see that the materials are exposed to the designated temperature for a period of time sufficient to be assured that the *entire contents* in each of the respective materials attain the required tem-

perature, and are kept at that temperature for the time periods mentioned above. This may necessitate exposure for longer time intervals than indicated above.

The use of thermocouples is advocated when sterilizing heavy loads so as to determine the actual temperature and duration attained in the center of the load.

When sterilization of injections can be effected by Process C or Process F without decomposing or otherwise changing the injection so treated, these processes are to be used.

Sterilization of injections by heating processes is carried out preferably in the final container in which the injection is dispensed.

Suppositories

Suppositories are solid bodies of various weights and shapes, adapted for introduction into different orifices of the human body, and usually melting or softening at body temperature. The vehicles usually employed are theobroma oil, glycerinated gelatin, or sodium stearate.

The following applies to the use of either theobroma oil or glycerinated gelatin in suppositories.

Rectal Suppositories for adults usually weigh about 2 Gm. each and are tapered.

Urethral Suppositories (*Bougies*) are pencil-shaped, pointed at one extremity, and either 7 cm. in length, weighing about 2 Gm. each, or 14 cm. in length, weighing about 4 Gm. each.

Vaginal Suppositories are usually globular or oviform in shape and weigh about 5 Gm. each.

Theobroma Oil Suppositories—For suppositories made with theobroma oil, the following processes may be employed:

Take of:

The Medicinal Substance, the prescribed quantity,
Theobroma Oil, grated, a sufficient quantity.

Reduce the medicinal substance, if dry, to a very fine powder, or, if an extract, soften it with an appropriate liquid, then mix it thoroughly in a mortar with about an equal weight of grated theobroma oil, and incorporate the remainder of the theobroma oil until a homogeneous, plastic mass is obtained. Roll the mass on a graduated tile until a cylinder of the proper length is formed, divide this into the required number of equal parts, and with a spatula, or other mechanical aid, form them into the desired shape.

If the process of cold compression is preferred, mix the medicinal substance in a suitable mortar with about an equal weight of grated theobroma oil, as directed above, then thoroughly incorporate it with the remainder of the theobroma oil, previously finely grated, chilling the mortar, if necessary, to preserve the pulverulent form of the mixture. Transfer the mass to the cylinder of an appropriate suppository compressor, and by the use of this apparatus prepare the desired number of compressed suppositories.

If the process of fusion is preferred, mix the medicinal substance with about an equal weight of grated theobroma oil, as directed above, then thoroughly incorporate it with the remainder of the theobroma oil, previously melted by gentle heat on a

water bath, in a suitable vessel provided with a lip. Allow the mixture to cool to about 38°, and, when it begins to congeal, pour it immediately into suitable well-cooled moulds. Keep the filled moulds at a cold temperature until the suppositories have hardened and are ready to be removed.

For suppositories containing chloral hydrate, phenol, or other substances which soften the vehicle, raise the melting point of the mixture by the addition of a small quantity of spermaceti or other suitable hardening agents. The finished suppositories must melt at body temperature.

Storage—Preserve suppositories with theobroma oil base in well-closed containers, preferably at a temperature below 30°.

Glycerinated Gelatin Suppositories—For suppositories made with glycerinated gelatin, the following process may be used:

Take of:

The Medicinal Substance, the prescribed quantity,
Glycerinated Gelatin,
Glycerin,
Distilled Water, each, a sufficient quantity.

Mix the medicinal substance, if solid and soluble, in distilled water or glycerin, or if a miscible liquid, with a little distilled water, and add sufficient glycerin to make the weight of the mixture one-half that of the finished mass. Then thoroughly incorporate it with an equal weight of melted glycerinated gelatin, and pour it at once into suitable moulds which have been greased with a small quantity of liquid petrolatum. Cool the moulds thoroughly before removing the suppositories. Moulds for urethral suppositories should be warmed sufficiently before pouring the mass to facilitate the proper filling of the mould. Suppositories of a firmer consistence may be prepared by replacing a portion of the distilled water or glycerin with acacia mucilage.

If the medicinal substance is insoluble in water or glycerin, thoroughly triturate it in a warm mortar with a sufficient quantity of glycerin to make the weight of the mixture one-half that of the finished mass. Then thoroughly incorporate it with an equal weight of melted glycerinated gelatin, and pour into suitable moulds as directed above. With bulky powders, about one-half of the glycerin may be replaced with distilled water before trituration.

Storage—Preserve glycerinated gelatin suppositories in tight containers, preferably at a temperature below 35°.

Tensile Strength Determination

Unless otherwise directed, a tensile testing machine should be used in an atmosphere having a relative humidity of 65 per cent, ± 2 per cent, and a temperature of 21°, ± 1.1° (70° F., ± 2° F.).

Tensile Strength of Surgical Sutures—The tensile strength of surgical sutures is to be determined on a motor-driven tensile strength testing machine using the principle of the constant specimen-rate-of-load, having suitable clamps for holding the specimen firmly. This description applies specifically to that known as the Incline Plane Tester.

The clamp for holding the specimen shall be of the roll type, with a flat gripping surface. The roll shall have a diameter of 0.75 inch, and the flat gripping surface shall be not less than 1 inch in length. The length of the specimen, when inserted in the clamps, shall be 5 inches from nip to nip. When a specimen breaks within 0.5 inch of the nip of the clamp, that reading shall be discarded.

The carriage used in any test shall be of such a weight that when the break occurs, the position of the recording pen on the chart shall be between 20 per cent and 80 per cent of the capacity that may be recorded on the chart.

The friction in the carriage must not exceed that which will permit the recording pen to depart from the zero line of the chart at a point not exceeding 2.5 per cent of the capacity of the chart when no specimen is held in the clamps.

The speed of inclination of the plane of the tester shall be such that it will reach its full inclination of 30° from the horizontal in 20 seconds, ± 1 second, from the start of the test.

The tensile strength of Surgical Gut shall be determined immediately after removal from the tubing fluid, without drying of the specimen.

The tensile strength of Surgical Silk, and of Sterile Surgical Silk that has been packaged dry, shall be determined after the Silk has been conditioned 4 hours in an atmosphere having a relative humidity of 65 per cent, ± 2 per cent, at a temperature of 21°, ± 1.1° (70° F., ± 2° F.).

The tensile strength of Sterile Surgical Silk that has been packaged in a tubing fluid shall be determined immediately after removal from the tubing fluid, without drying or conditioning of the specimen.

When placing the specimen in the jaws of the testing machine, clamp one end of the suture, pass the other end through the opposite clamp, apply a tension of about ¼ of the required minimum tensile strength of the suture to the free end of the specimen, and close the second clamp. Perform as many breaks as are required in the respective monographs.

To determine the tensile strength of surgical sutures over a surgeon's knot, tie the surgeon's knot on one turn of suture around a flexible rubber tube having a diameter of 6.5 mm. (about ¼ inch). The surgeon's knot must be a square knot in which the free end is first passed twice, instead of once, through the loop, and pulled taut, then passed once through a second loop, and the ends drawn taut so that a single knot is superimposed upon a compound knot. The first knot must be started with the left end over the right end; then place the specimen in the clamps of the testing machine as directed above, having the knot approximately midway between the clamps, and perform as many breaks as are directed in the monograph.

Tensile Strength of Textile Fabrics—The tensile strength of textile fabrics, including Adhesive Plaster, is to be determined on a constant-speed, or pendulum type of testing machine, having suitable clamps for holding the specimen securely.

The clamps for holding the specimen, in a pendulum type tester, shall have smooth, flat, parallel jaws. The dimension of all gripping surfaces parallel to the direction of application of the load shall not be less than 1 inch (25.4 mm.). When the width of the strip being tested does not exceed 0.75 inch, the jaws of the clamp should be at least 1 inch in width. If the width of the strip is greater than 0.75 inch and not greater than 1.75 inch, the width of the jaws of the clamp should be at least 2 inches. If the width of the specimen is greater than 1.75 inch, cut a 1-inch strip

and use a clamp with jaws not less than 2 inches in width. All edges which might have a cutting action on the specimen shall be rounded to a radius of 1/64 inch (0.4 mm.).

The jaws of the pendulum type tester shall be 3 inches (76.2 mm.) apart at the beginning of the test, and shall separate at the rate of 12 inches, ± 1/2 inch (30.5 cm., ± 13 mm.), per minute.

The pendulum type testing machine shall be of such capacity that when the break occurs, the deviation of the pendulum from the perpendicular shall be not less than 9° nor more than 45°.

Thermometers for Pharmacopœial Testing

These thermometers conform to the specifications of the American Society for Testing Materials, the specifications being designated as follows:

Types	*A.S.T.M. designation*
I—For general purposes	E1 (1C-39)
II—For general purposes	E1 (2C-39)
III—For petrolatum and other Type III melting points	E1 (14C-39)
IV—For determining kinematic viscosity	E1 (18C-39)
V—For determining the titer of fatty acids	E1 (36C-42)
VI—For boiling or distilling temperatures	E1 (7C-39)
VII—For boiling or distilling temperatures	E1 (8C-42)

The stem of each thermometer shall be made of suitable thermometer tubing and shall have a plain front and an enameled back. All graduation lines, figures, and letters shall be clear-cut on the glass stem and shall be uniformly well filled with insoluble colored pigment.

The bulb of each thermometer shall be made of Corning normal or equally suitable thermometric tubing.

The thermometers shall be so thoroughly annealed that there will be no appreciable change in their indications after long-continued exposure to the highest temperature on the scale.

The thermometer shall be standardized immersed in the testing bath to the top of the mercury column (total immersion) unless other conditions of immersion are prescribed in the table.

For further details regarding the standardization of these thermometers, reference should be made to A.S.T.M. Standards, Part III, American Society for Testing Materials

(*Footnote continued from page 702*)

‡ The thermometer shall be standardized for 76-mm. or 3-in. immersion and for the following temperatures of the emergent mercury column. These stem temperatures have been chosen as those likely to occur in the use of the thermometer.

Thermometer Reading	Average Temperature of Emergent Mercury Column
50°	35°
100°	49°
150°	61°
200°	70°
250°	76°
300°	80°

Thermometer Specifications

Thermometer Type	I	II	III	IV	V	VI	VII
Liquid	Mercury	Mercury	Mercury	Mercury	Mercury	Mercury	Mercury
Filling above liquid	Nitrogen	Nitrogen	Nitrogen	Nitrogen	Nitrogen	Nitrogen	Nitrogen
Temperature range	−20° to +150°	−5° to +300°	38° to 82°	34° to 42°	−2° to +68°	0° to 300°	0° to 400°*
Subdivisions	1°	1°	0 1°	0.1°	0 2°	1°	1°
Total length	303 to 307 mm.	379 to 383 mm.	365 to 371 mm.	252 to 256 mm.	385 to 390 mm.	378 to 384 mm.	378 to 384 mm
Stem diameter	6.0 to 7.0 mm.	6.0 to 7 0 mm.	6.0 to 7 0 mm.	6.0 to 7 0 mm.	6.0 to 7 0 mm.	6.0 to 7 0 mm.	6.0 to 7.0 mm.
Bulb diameter	5.0 to 6.0 mm.	5.0 to 6.0 mm.	Not greater than stem	5 0 mm. to diam. of stem	5.5 to 7 0 mm.	5 0 to 6.0 mm.	5.0 to 6.0 mm
Bulb length	19 to 25 mm.	10 to 15 mm.	Not over 28 mm.	25 to 35 mm.	15 to 25 mm.	10 to 15 mm.	10 to 15 mm.
Bottom of bulb to graduation line at distance	−18° 90 to 100 mm.	0° 100 to 110 mm.	38° 105 to 115 mm.	34° 135 to 150 mm.	−2° 50 to 60 mm.	0° 100 to 110 mm.	0° 25 to 45 mm.
Top of thermometer to graduation line at distance	150° 20 to 35 mm.	300° 25 to 50 mm.	82° 25 to 40 mm.	42° 20 to 35 mm.	68° 20 to 35 mm.	300° 30 to 45 mm.	400° 30 to 45 mm.
Longer graduation lines at each	5°	5°	0.5°	0.5°	1°	5°	5°
Graduations numbered at each multiple of	10°	10°	1°	1°	2°	5°	5°
Immersion	76 mm.	76 mm.	79 mm.	Total	45 mm.	Total	Total
Scale error at any point, when standardized, shall not exceed	0.5°	1°	0 1°	0 1°	0 2°	0 5°	1°
Standardization	†	‡	Every 10°, and for average temp. 25° of emergent stem	Total immersion	Ice point and at 20° intervals, and for average temp. 25° of emergent stem	Ice point, every 50° and at 300°	Ice point, every 50° and at 370°

* Under certain test conditions, the temperature of bulb of the thermometer may be 28° above the temperature indicated by the thermometer, and at an indicated temperature of 371° the temperature of the bulb is approaching a critical range in the glass. It is not desirable to use this thermometer under such conditions at indicated temperature above 371° without checking the ice point.

† The thermometer shall be standardized for 76-mm. or 3-in. immersion and for the following temperatures of the emergent mercury column. These stem temperatures have been chosen as those likely to occur in the use of the thermometer.

Thermometer Reading	Average Temperature of Emergent Mercury Column
50°	35°
100°	48°
150°	55°

(*See page 701 for continuation of footnote*)

Thiamine Assay

Biological Method

The biological assay, comprising the recording of observations of rats throughout specified periods of their lives, while being maintained on specified dietary regimens, and the interpretation of such data, is as follows:

Preliminary Period—Throughout the preliminary period each rat shall be raised under the immediate supervision of, or according to directions specified by, the assayer. Throughout the preliminary period the rats shall be maintained on a dietary regimen which shall provide for normal development in all respects, except that the thiamine hydrochloride intake may be restricted.

Depletion Period—A rat shall be suitable for the depletion period when the age of the rat does not exceed 30 days, and if the body weight of the rat does not exceed 50 Gm. and if the animal manifests no evidence of injury or disease or anatomical abnormality which might hinder growth and development. Throughout the depletion period each rat shall be provided with the thiamine hydrochloride test diet and water (U. S. P.) ad libitum, and during this period no other dietary supplement shall be available to the animal. Throughout the depletion period and until the assay shall have been completed, the rats shall be kept in cages provided with a wire cloth bottom, each mesh of which shall be not less than 8 mm.

Assay Period—A rat shall be suitable for the assay period, provided that the depletion period shall not have exceeded 75 days, and provided that the rat shall manifest evidence of thiamine hydrochloride deficiency characterized by acute polyneuritis. Throughout the assay period each rat shall be kept in an individual cage and provided with the thiamine hydrochloride test diet, compounded from the same lots of ingredients, and water (U. S. P.) ad libitum. On the day beginning the assay period there shall be administered to each rat a single dose of the reference standard of such size that it will produce in individual animals a curative period of not less than 5 days and not more than 15 days. All of the rats used in any one assay shall receive the same quantity of the reference standard. Each rat shall then be observed for the cure of and recurrence of polyneuritis, and when polyneuritis reaches the same acute stage observed when the reference standard was administered, a single dose of the assay product shall be administered. The animals shall then be observed to determine if polyneuritis is cured, and, if so, observation shall be made of the duration of the period. Each assay shall include successive administration of the reference standard and assay product to not less than eight rats. The assay product may be administered orally or parenterally, but in any one assay the reference standard shall be administered in the same manner as the assay product, and the quantity of the assay product administered to each rat shall be the same.

Recording of Data—On the day beginning the depletion period and at intervals of not more than 7 days during the depletion period, a record shall be made of the body weight of each rat. On about the twenty-fifth day and each day thereafter for the remainder of the depletion period, each rat shall be observed for symptoms of polyneuritis. The following dates shall be recorded:

1. The day on which the reference standard is administered.

2. The day on which cure of polyneuritis is observed following the administration of the reference standard.

3. The day on which acute polyneuritis recurs and the assay product is fed.

4. The day on which cure of polyneuritis is observed following the administration of the assay product.

5. The day on which acute polyneuritis recurs after the administration of the assay product.

Thiamine Hydrochloride or Vitamin B_1 Potency of the Assay Product—In determining the thiamine hydrochloride potency of the assay product, the duration of the curative period following the administration of the reference standard and the assay product shall be considered. The dose of the assay product administered contains an amount of the thiamine hydrochloride equal to or greater than that contained in the dose of the reference standard administered if that quantity promotes in the assay animals a total curative period (the sum of the number of days of the curative period of each of the animals) equal to or greater than the total curative period produced by administration of the reference standard.

Definitions—As used herein, unless the context otherwise indicates, the term *acute polyneuritis* means that stage of thiamine hydrochloride deficiency in which the animal regains control of the voluntary muscles, as evidenced by standing or walking, a few seconds after extreme muscular contraction, which has been induced by twirling the rat by its tail (the onset of acute polyneuritis is invariably accompanied by loss in body weight). The term *assay period* means the interval in the life of a rat between the last day of the depletion period and the final observation following the administration of the assay product; the term *assay product* means a product under examination for its thiamine hydrochloride potency; the term *curative period* is the interval of time between the administration of thiamine hydrochloride and the subsequent recurrence of acute polyneuritis after a complete disappearance of polyneuritic symptoms, and the duration of the curative period is expressed as the number of days in that interval; the term *cure of polyneuritis* means the complete disappearance of polyneuritic symptoms and is invariably accompanied by increase in body weight; the term *depletion period* means the interval in the life of a rat during which its food intake is only the thiamine hydrochloride test diet and water (U. S. P.); the term *preliminary period* means the interval in the life of a rat prior to the depletion period; the term *reference standard* means the U. S. P. Thiamine Hydrochloride Reference Standard; the term *thiamine hydrochloride test diet* means a uniform mixture, which has not been compounded for more than 7 days, of the following food materials and in the proportions designated:

Thiamine Hydrochloride or Vitamin B_1 Test Diet—

Sucrose	60.25 per cent
Casein (1)	18 per cent
Salt Mixture (2)	4 per cent
Autoclaved Yeast (3)	5 per cent
Autoclaved Peanuts (4)	10 per cent
Purified Liver Extract (5)	0.75 per cent
Cod Liver Oil	2 per cent

(1) The casein shall be free from demonstrable traces of thiamine hydrochloride.

(2) The salt mixture shall be either salt mixture No. 1, described on page 720, or a salt mixture having essentially the same proportions of the elements.

(3) Dried yeast which has been autoclaved in steam at 15 pounds pressure for 5 hours with the yeast spread in a layer not more than 6 mm. in depth and then dried at a temperature not exceeding 65°.

(4) Unroasted shelled No. 1 grade Virginia peanuts are crushed in a food chopper, autoclaved in steam at 15 pounds pressure for 5 hours with the ground peanuts spread in a layer not more than 12 mm. in depth, and then dried at a temperature not exceeding 65°. This preparation may be incorporated in the basal diet by grinding with the requisite quantity of sucrose.

(5) Dissolve 100 Gm. of Liver Extract* in 1 liter of 0.6 per cent sodium bisulfite solution. Let stand 24 hours in a well-stoppered bottle; acidify with hydrochloric acid to a pH of 1.5. Concentrate by distillation under reduced pressure at a temperature not exceeding 50° to one-half the original volume. Dry on vitamin B_1-free casein at a temperature not exceeding 65°.

Suggestions for Using the U. S. P. Thiamine Hydrochloride Reference Standard

Before preparing a solution of the Reference Standard, dry it to constant weight in a desiccator over phosphorus pentoxide.

Precautions to Be Taken in the Preparation of Solutions—Because of the hygroscopic nature of the completely desiccated U. S. P. Thiamine Hydrochloride Reference Standard, it is preferable to transfer the quantity required for a test to a small glass-stoppered weighing bottle, in which it can then be weighed on a microbalance, or an ordinary balance according to the number of tests for which it is to be used. Even without such precautions, however, exposure to air during weighing will not cause an increase in weight of more than about 0.6 per cent, if the operations are completed within 5 minutes.

Neutral and alkaline solutions of thiamine hydrochloride are unstable, and water-acid solutions are readily infected by molds, which inactivate the vitamin. Therefore, stock solutions should be prepared using 25 per cent alcohol and containing sufficient hydrochloric acid to make the solution approximately five-hundredth normal. A convenient strength for a stock solution is 0.5 mg. of thiamine hydrochloride to each cc. These solutions are stable if stored at about 4°.

Solutions of suitable strength for animal dosage (20 to 100 micrograms per cc.) must be made at least twice weekly from the stock solution by dilution with water. Such dilutions must be kept at a low temperature and examined daily for mold.

Thiochrome Method

Double-Normal Sodium Acetate—Dissolve 275 Gm. of reagent sodium acetate in sufficient water to make 1000 cc.

Bromocresol Green pH Indicator—See page 850.

Thymol Blue pH Indicator—See page 850.

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*The Liver Extract used in this *Test Diet* must contain, in each Gm., at least that amount of material from liver which, when given daily to patients with pernicious anemia, has produced a satisfactory hematopoietic response.

Enzyme Solution—Prepare on the day on which it is to be used a 10 per cent solution in water of an enzyme preparation potent in diastatic and phosphorolytic activity.

Base Exchange Silicate—Purify an artificially prepared silicate of the base-exchange type, in the form of a granular powder of 50- to 80-mesh size, in the following manner: Place a convenient quantity (100 to 500 Gm.) of the base exchange silicate in a suitable beaker, add sufficient hot 3 per cent acetic acid ($HC_2H_3O_2$) to cover the material, and boil for 10 to 15 minutes, stirring frequently. Allow to settle, and decant the supernatant liquid. Repeat this washing three times. Then wash in a similar manner three times with a hot 25 per cent solution of potassium chloride (1 part by weight of KCl in 4 volumes of solution) and finally wash with boiling water until the last washing gives no reaction for chloride. Dry the material at approximately 100° and store in a well-closed container.

Base Exchange Tube—The base exchange glass tube has an over-all length of 200 mm. A reservoir at the upper end is 50 mm. in length and 25 mm. in diameter. This converges into the adsorption tube which is 5 to 6 mm. in internal diameter and approximately 140 mm. long. At the lower end the tube is drawn into a capillary approximately 10 mm. long and of such diameter that when the tube is charged the rate of flow will be not more than 1 cc. per minute.

Prepare the tube for use by placing over the upper end of the capillary, with the aid of a glass rod, a pledget of fine glass wool. Add a water suspension of 1.0 to 2.0 Gm. of the purified base exchange silicate to the adsorption tube, taking care to wash down all of the silicate from the walls of the reservoir. To keep air out of the adsorption column, a layer of liquid must be kept above the surface of the silicate throughout the adsorption process and the tube may be prevented from draining by placing a rubber cap (filled with water to avoid inclusion of air) over the lower end of the capillary.

Neutral Potassium Chloride Solution—Dissolve 250 Gm. of reagent potassium chloride in sufficient water to make 1000 cc.

Acid Potassium Chloride Solution—Add 8.5 cc. of reagent hydrochloric acid to 1000 cc. of the neutral potassium chloride solution.

Sodium Hydroxide Solution, 15 per cent—Dissolve 15 Gm. of sodium hydroxide in sufficient water to make 100 cc.

Potassium Ferricyanide Solution, 1 per cent—Dissolve 1 Gm. of reagent potassium ferricyanide in sufficient water to make 100 cc. This solution must be freshly prepared on the day it is used.

Oxidizing Reagent—Prepare the solution by mixing 4.0 cc. of the 1 per cent potassium ferricyanide solution with sufficient of the 15 per cent sodium hydroxide solution to make 100 cc. This solution should be used within 4 hours.

Quinine Sulfate Stock Solution—Quinine sulfate solution is used to govern the reproducibility of the fluorophotometer. A stock solution of quinine sulfate is prepared by dissolving 10 mg. of quinine sulfate in sufficient tenth-normal sulfuric acid to make 1000 cc. Preserve this solution in light-resistant containers.

Quinine Sulfate Standard Solution—Dilute 1 volume of the quinine sulfate stock solution with 39 volumes of tenth-normal sulfuric acid. This solution fluoresces to approximately the same degree as the thiochrome obtained from 1 microgram of thiamine hydrochloride. Preserve this solution in light-resistant containers.

Thiamine Hydrochloride Stock Solution—Weigh accurately 20 to 25 mg. of U. S. P. Thiamine Hydrochloride Reference Standard which has been kept in a desiccator over phosphorus pentoxide for at least 16 hours. Since the Reference Standard is hygroscopic, precautions must be taken to avoid absorption of moisture. Dissolve in 20 per cent alcohol adjusted to a pH of 3.5 to 4.3 with hydrochloric acid and make up to a volume of 1000 cc. Store in a cool place in a well-closed, light-resistant container.

Thiamine Hydrochloride Standard Solution—From a portion of the stock solution that has been warmed to room temperature, transfer to a 100-cc. volumetric flask an aliquot containing exactly 100 micrograms of thiamine hydrochloride, and dilute to 100 cc. with water adjusted to a pH of 3.5 to 4.3 with hydrochloric acid. Each cc. of this solution contains 1 microgram of thiamine hydrochloride.

Dilutions of this solution are treated in the same manner as that used in the *Preparation of Assay Solution* with respect to acid digestion, enzyme treatment, adsorption, and elution from the base exchange silicate.

Preparation of Assay Solution—The amount of material taken for the assay should be such that the ratio of the volume of tenth-normal sulfuric acid used for the extraction to the quantity of sample is at least 15 to 1, and the content of thiamine equivalent to 30 to 100 micrograms of thiamine hydrochloride. Place the accurately weighed quantity of the material to be assayed in 65 cc. of tenth-normal sulfuric acid contained in a 100-cc. centrifuge tube and digest it on a steam bath, with frequent mixing, for 30 minutes. The liquid must remain acid during the digestion. If it is not distinctly acid to the thymol blue pH indicator, add sufficient diluted sulfuric acid to make it acid. Cool, and adjust the pH to between 4 and 4.5 by the addition of double-normal sodium acetate solution, using bromocresol green pH indicator as an external indicator in conjunction with a spot plate. Add 5 cc. of the enzyme solution, mix, and incubate at 45° to 50° for 3 hours. Cool, centrifuge the mixture until the supernatant liquid is clear or practically so, and quantitatively transfer the supernatant liquid to a 100-cc. volumetric flask. Wash the residue by centrifuging with 10 cc., then with 5 cc. of tenth-normal sulfuric acid. Add the washings to the supernatant liquid and dilute to 100 cc. with water.

Pass through the prepared base exchange tube an aliquot of the solution estimated to contain 5 to 10 micrograms of thiamine, wash the tube with three 5-cc. portions of boiling water, taking care to prevent the surface of the liquid from falling below the surface of the silicate.

Elute the thiamine from the *base exchange silicate* by passing successively through the tube small portions of hot *acid potassium chloride solution.* Collect the first 15 to 20 cc. of the liquid (*eluate*) in a glass-stoppered, 25-cc. volumetric flask, cool, and dilute to a volume of 25 cc. with acid potassium chloride solution. *This constitutes the assay solution.*

Oxidation of Thiamine to Thiochrome and Measurement of Fluorescence—Determine the thiamine content of the oxidized assay solution by comparing the intensity of fluorescence of an extract of this solution exposed to ultraviolet rays ranging from 350 mμ to 400 mμ with that of oxidized Thiamine Hydrochloride Standard Solution. The intensity of the fluorescence is proportional to the quantity of thiamine present and may be measured with the aid of various instruments.

To oxidize thiamine to thiochrome, add to quantities of the assay solution and of the similarly treated Thiamine Hydrochloride Standard Solution containing from 0.10 to 2 micrograms of thiamine, sufficient acid potassium chloride solution to produce a volume of 5 cc. Then add, with mixing, 3 cc. of oxidizing solution. Within 2 minutes add 13 cc. of isobutyl alcohol and shake vigorously for at least 1½ minutes. Centrifuge the mixture at a low speed until a clear supernatant solution is obtained. Measure in a fluorometer the intensity of fluorescence of the isobutyl alcohol solution directly if clear, or, if cloudy, after shaking with 2 Gm. of anhydrous sodium sulfate. Compare with this the intensity of fluorescence produced after oxidation of the properly prepared Thiamine Hydrochloride Standard Solution. Quinine Sulfate Standard Solution is used to govern the reproducibility of the instrument. Correction must be made for fluorescence produced by substances other than thiamine by determining the intensity of fluorescence of Thiamine Hydrochloride Standard Solution, and assay solutions treated as described above, but with 15 per cent sodium hydroxide solution replacing the oxidizing reagent.

The *Thiochrome Method* is applicable to substances such as Thiamine Hydrochloride, and a number of other products, but cannot be relied upon when certain interfering substances are present; in the latter case, use the *Biological Method*, page 703.

Tinctures

Tinctures are alcoholic or hydro-alcoholic solutions prepared from animal or vegetable drugs or from chemical substances.

The proportion of drug represented in the different tinctures is not uniform but varies according to the established standards for each. Tinctures of potent drugs essentially represent the activity of 10 Gm. of the drug in each 100 cc. of tincture. This conforms in principle to the recommendation of the International Protocol as adopted at Brussels, and with international standards. In this group are most of the tinctures which are assayed and adjusted to standards. Most of the other tinctures represent 20 Gm. of the respective drugs in each 100 cc. of tincture. Compound tinctures are made according to long established formulas, and the two official tinctures of fresh drugs are made to represent 50 Gm. of the respective drugs in each 100 cc. of tincture.

The general processes to be employed for the manufacture of tinctures, unless otherwise directed in the individual monographs, are as follows:

Process P. Carefully mix the ground drug or mixture of drugs with a sufficient quantity of the prescribed menstruum to render it evenly and distinctly damp, allow it to stand for 15 minutes, transfer it to a suitable percolator, and pack the drug firmly. Pour on enough of the prescribed menstruum to saturate the drug, cover the top of the percolator, and when the liquid is about to drip from the percolator, close the lower orifice, and allow the drug to macerate for 24 hours or for the time specified in the monograph. If no assay is directed, allow the percolation to proceed slowly, or at the specified rate, gradually adding sufficient menstruum to produce 1000 cc. of tincture, and mix thoroughly. If an assay is directed, collect only 950 cc. of percolate, mix this thoroughly, and assay a portion of it as directed. Dilute the remainder with such a quantity of the prescribed menstruum as calculation from the assay indicates is necessary to produce a tincture that conforms to the prescribed standard. Mix well. The rate of flow of percolates is defined on page 654.

Process M. Macerate the drug or mixture of drugs in a container which can be closed, in a moderately warm place, with 750 cc. of the prescribed menstruum, agitating it frequently for 3 days or until the soluble matter is dissolved. Transfer the mixture to a filter, and when most of the liquid has drained away, wash the residue on the filter with a sufficient quantity of the prescribed menstruum, combining the filtrates, to produce 1000 cc. of tincture. Mix the product well.

Packaging and Storage—Preserve Tinctures in tight, light-resistant containers and avoid exposure to direct sunlight and to excessive heat.

Triturations

Unless otherwise directed, triturations are to be prepared according to the following formula:

Take of:

The Medicinal Substance	10 Gm.
Lactose, in fine powder	90 Gm.
To make	100 Gm.

Place the medicinal substance, previously reduced, if necessary, to a moderately fine powder, in a mortar. Add about an equal measure of lactose, and triturate the powders thoroughly together. Then add successive portions of the lactose, from time to time, until the whole is added, and continue the trituration after each addition until the medicinal substance is intimately mixed with the lactose and reduced to a fine powder

Turbidimetric Tests

These tests are applied to certain official chemicals to insure the absence of excessive amounts of chloride or sulfate.

In carrying out these turbidimetric tests, the following points are to be observed: The same quantities of the same reagents must be used in the test of the substance under examination and in the control test. The glass cylinders in which the tests are made must be of the same diameter and match in all other respects as closely as possible. The precipitating reagent must be added to both in immediate sequence.

If the solution, after the addition of acid, is not perfectly clear, filter it through a filter paper free from chloride or sulfate, then add the silver nitrate or the barium chloride.

When the tests for chloride or sulfate are to be applied to a specified volume of a solution of a substance prepared as directed in the text, and the permissible limit for these impurities corresponds to 0.2 cc. or less of fiftieth-normal hydrochloric or sulfuric acid, the solution is not to be further diluted. The control test is also made with the same volume of water (or other specified solvent) as in the test.

In applying the turbidimetric tests to salts of heavy metals, which normally show an acid reaction, their solutions prepared for the test are not to be neutralized.

Chloride—The prescribed quantity of the substance to be tested is dissolved in from 30 to 40 cc. of water, and the solution neutralized, if necessary, with nitric acid, using litmus paper as the indicator. One cc. of nitric acid and 1 cc. of silver nitrate T.S. are added and then sufficient water to make 50 cc. After mixing well and allowing to stand 5 minutes protected from direct sunlight, the turbidity, if any, is

compared with that produced in a control test made with the specified volume of fiftieth-normal hydrochloric acid.

Bismuth salts are first dissolved in a few cc. of water and 2 cc. of nitric acid, then diluted with water to 50 cc.

Sulfate—The specified quantity of the substance to be tested is dissolved in from 30 to 40 cc. of water, and the solution neutralized, if necessary, with hydrochloric acid, using litmus paper as the indicator. One cc. of diluted hydrochloric acid and 2 cc. of barium chloride T.S. are added and then sufficient water to make 50 cc. After mixing well, it is allowed to stand for 10 minutes and the turbidity, if any, is compared with that produced in a control test made with the specified volume of fiftieth- normal sulfuric acid.

Vegetable and Animal Drugs, Methods for Sampling and Analysis

I—Sampling from Original Containers—

a—It is recommended that gross samples of vegetable or animal drugs in which the component parts are 1 cm. or less in any dimension, and all powdered or ground drugs, be taken by means of a sampler which removes a core from the top to the bottom of the container, not less than two cores being taken in opposite directions; that when the total weight of the drug to be sampled is less than 100 kilos (200 pounds) at least 250 Gm. shall constitute an *official sample.* When the total weight of the drug to be sampled is in excess of 100 kilos, repeated samples shall be taken by the above method, and according to the schedule given below, mixed and quartered, two of the diagonal quarters being rejected, the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same manner until two of the quarters weigh at least 250 Gm., which latter quarters shall constitute an *official sample.*

b—It is recommended that gross samples of vegetable drugs in which the component parts are over 1 cm. in any dimension be taken by hand. When the total weight of the drug to be sampled is less than 100 kilos, at least 500 Gm. shall constitute an *official sample,* and this shall be taken from different parts of the container or containers. When the total weight of the drug to be sampled is in excess of 100 kilos, repeated samples shall be taken by the above method and according to the schedule below, mixed and quartered, two of the diagonal quarters being rejected, and the remaining two quarters being combined and carefully mixed, and again subjected to a quartering process in the same manner until two of the quarters weigh not less than 500 Gm., which latter quarters shall constitute an *official sample.*

Schedule Recommended For Sampling

Number of packages in shipment	*Number of packages to be sampled*
1 to 10	1 to 3
10 to 25	3 to 4
25 to 50	4 to 6
50 to 75	6 to 8
75 to 100	8 to 10

When over 100, the total number sampled should not be less than 10.

c—When the total weight of a drug to be sampled is less than 10 kilos, it is recommended that the above methods be followed but that somewhat smaller quantities be withdrawn, and in no case should the final *official sample* weigh less than 125 Gm.

d—In addition to the withdrawing of *official samples* according to methods a, b, and c, the *official sample* may consist of the total amount of a direct purchase made by Federal, State, or Municipal Food and Drugs Act enforcement officials.

II—Foreign Organic Matter in Whole Vegetable Drugs—

Withdraw from 25 to 500 Gm. from the *official sample*, spread out in a thin layer, and separate the foreign organic matter by hand as completely as possible. Weigh it and determine the per cent of foreign organic matter, calculated upon the weight of drug taken. Use the maximum quantity of sample for coarse or bulky drugs.

III—Preparation of Vegetable or Animal Drugs for Analysis—

The following method is to be used where specific directions are not otherwise given in the text: Withdraw as much as may be necessary of the *official sample* by quartering, taking pains to see that the portion is representative of the gross sample. In the case of unground or unpowdered drugs, grind the withdrawn sample so that it will pass through a No. 20 standard mesh sieve. If the sample cannot be ground, reduce it to as fine a state as possible. Mix by rolling it on paper or sampling cloth, spread it out in a thin layer and withdraw the portion for analysis. The disintegration of semi-solid drugs may be facilitated by the use of a meat grinder or a similar apparatus.

IV—Total Ash in Vegetable Drugs—

Accurately weigh a quantity of the ground drug, representing from 2 to 4 Gm. of the air-dried material, in a tared crucible and incinerate at a low temperature, not to exceed very dull redness, until free from carbon, and determine the weight of the ash. If a carbon-free ash cannot be obtained in this way, exhaust the charred mass with hot water, collect the insoluble residue on an ashless filter paper, incinerate the residue and filter paper until the ash is white or nearly so, then add the filtrate, evaporate it to dryness, and heat the whole to a low redness. If a carbon-free ash cannot be obtained in this way, cool the crucible, add 15 cc. of alcohol, break up the ash with a glass rod, burn off the alcohol, and again heat the whole to a low redness. Finally determine the weight of the ash. Calculate the percentage of total ash from the weight of the drug taken.

V—Acid-insoluble Ash in Vegetable Drugs—

Boil the ash obtained under paragraph IV with 25 cc. of diluted hydrochloric acid for 5 minutes, collect the insoluble matter on a tared Gooch crucible or ashless filter, wash with hot water, ignite, and weigh. Determine the per cent of acid-insoluble ash calculated from the weight of drug taken.

Moisture in Vegetable and Animal Drugs

Use method *IX—Moisture Method by Toluene Distillation*, unless otherwise directed in the individual monograph.

VI—Preparation of Sample—

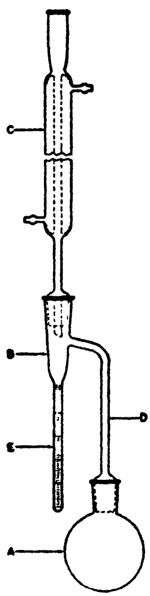
In the case of unground or unpowdered drugs, prepare about 10 Gm. of the *official sample* by cutting, granulating, or shredding, so that the parts are about 3 mm. in thickness. Seeds or fruits smaller than 3 mm. should be cracked. High-speed mills should not be used for preparing the sample and care should be taken that no appreciable amount of moisture is lost during the preparation and that the portion taken is representative of the *official sample*.

VII—Moisture Method for Drugs Containing No Constituents Volatile at 100°—

Accurately weigh about 10 Gm. of the drug as prepared under paragraph VI in a tared evaporating dish. Dry at 100° for 5 hours, and weigh. Continue the drying and weighing at 1-hour intervals until the loss is not more than 0.25 per cent in 1 hour's drying.

VIII—Moisture Method for Drugs Containing Ether-soluble Constituents Volatile at 100°—

Proceed as under paragraph VII. Determine the volatile ether-soluble extractive (paragraph XV) and subtract the percentage of volatile ether-soluble extractive from the percentage lost during drying. The difference represents the percentage of moisture



Toluene Moisture Apparatus

IX—Moisture Method by Toluene Distillation—

Apparatus—The apparatus (see illustration) required consists of a glass flask (A) connected by means of a trap (B) to a reflux condenser (C). All joints in the apparatus should be of ground glass. The flask should have a capacity of 500 cc., should be either of the short-neck, round-bottom type or of the Erlenmeyer type, and should be made of resistance glass.

The length of the trap should be between 235 and 240 mm., and the distance between the connecting tube (D) and the receiving tube (E) should be between 45 and 55 mm. The internal diameter of the connecting tube should be between 9 and 11 mm. and where sealed to the body of the trap should be inclined at an angle of 15° from the horizontal. The length of the cylindrical portion of the receiving tube should be between 146 and 156 mm., and the internal diameter of the neck of the trap should be between 22 and 24 mm. The receiving tube should be graduated to contain 5 cc. and should be subdivided into 0.1-cc. divisions, each 1-cc. line being numbered from 5 cc. at the top. The error in any indicated capacity may not be greater than 0.05 cc.

The jacket of the condenser should be approximately 400 mm. in length, and the inner tube of the condenser should have an external diameter between 9.5 and 12.7 mm. The end of the condenser that is inserted into the trap should be ground

off at an angle of 30° from the vertical axis, and when inserted into the trap, the tip of the condenser should be about 7 mm. above the surface of the liquid in the trap after the distillation conditions have been established.

The source of heat is preferably an electric heater with rheostat control or an oil bath. The upper portion of the flask and the connecting tube may, if desired, be wrapped with asbestos paper or asbestos cord.

The receiving tube and the condenser must be chemically clean in order to permit the sharp separation of water. These parts should be cleaned with chromic acid cleansing mixture, thoroughly rinsed with water, and dried in an oven.

The toluene used in the moisture determination should first be saturated with water by shaking with a small quantity of water, separating it from the excess water, and distilling the toluene.

Determination—Place in the dry flask a quantity of the substance, weighed accurately to the nearest centigram, which it is estimated will yield from 2 to 4 cc. of water. If the substance is of a pasty character, it is best weighed in a boat of metal foil of a size that will just pass through the neck of the flask. If the substance is likely to cause bumping, add enough dry, washed sand to cover the bottom of the flask, or a number of capillary melting-point tubes, about 100 mm. in length, sealed at the upper end. Place about 200 cc. of toluene in the flask, connect the apparatus as illustrated, and fill the receiving tube (*E*) with toluene poured through the top of the condenser. Heat the flask gently for 15 minutes, and when the toluene begins to boil, distil at the rate of about 2 drops per second until most of the water has passed over; then increase the rate of distillation to about 4 drops per second. When the water has apparently all distilled over, rinse the inside of the condenser tube with toluene while brushing down the tube with a tube brush attached to a copper wire and saturated with toluene. Continue the distillation for 5 minutes, then remove the heat and allow the receiving tube to cool to room temperature. If any droplets of water adhere to the walls of the receiving tube, force them down with a rubber band wrapped around a copper wire and wet with toluene. When the water and toluene have separated completely, read the volume of water and calculate the percentage that was present in the substance.

X—Crude Fiber—

Exhaust a weighed quantity of the prepared drug (paragraph III), representing about 2 Gm. of the drug, with ether or use the residue from the determination of the volatile ether-soluble extractive (paragraph XV). Add 200 cc. of boiling sulfuric acid solution, adjusted to exactly 1.25 per cent by titration, to the ether-exhausted drug, in a 500-cc. flask, and connect the flask with a reflux condenser, the tube of which passes only a short distance below the rubber stopper, into the flask. Heat the mixture to boiling and continue the boiling exactly 30 minutes. Then filter through a linen or hardened-paper filter and wash the residue on the filter with boiling water until no longer acid. Rinse the residue back into the flask with 200 cc. of boiling sodium hydroxide solution, adjusted to exactly 1.25 per cent by titration and free from sodium carbonate. Again heat the mixture to boiling and continue the boiling exactly 30 minutes under the reflux condenser as described under the treatment with acid, then rapidly filter through a tared filter, wash the residue with boiling water until the last washing is neutral, dry it at 110° until of constant weight, and note the weight.

Now completely incinerate the dried residue and weigh the ash: the loss in weight is considered to be the weight of the crude fiber.

NOTE—The boiling with acid and alkali should continue *exactly* 30 minutes from the time that the liquid (which is cooled below the boiling point by adding it to the cold flask) again boils. After the solution has been brought to boiling, the flame should be turned low enough just to maintain boiling During the boiling the flask should be gently rotated from time to time to catch any particles which may adhere to the walls of the flask. A slow current of air introduced into the flask during the boiling operation will be very helpful to keep down excessive frothing.

Extractives

XI—Alcohol-soluble Extractive—

Weigh 2 Gm. of the prepared drug (paragraph III) into a dried and tared paper extraction thimble, using a glass-stoppered weighing bottle as the container, and place 0.2 Gm. of sodium hydroxide in the receiving flask. Extract the drug in a continuous extraction apparatus with alcohol, during 5 hours. Dry the insoluble residue at 100° for 30 minutes and weigh. Determine the moisture in the drug by the *toluene distillation method*, page 712, calculate the weight of moisture in the quantity of drug taken for the test and subtract it from the original weight of the drug taken for the test. The difference between this result and the weight of the residue determined as directed above represents the amount of alcohol-soluble extractive.

XII—Diluted Alcohol-soluble Extractive—

Macerate about 2 Gm. of the prepared drug (paragraph III), accurately weighed, in about 70 cc. of diluted alcohol in a suitable flask. Shake the mixture during 8 hours at 30 minute intervals and then allow it to stand for 16 hours without shaking. Filter and wash the flask and residue with small portions of diluted alcohol, passing the washings through the filter, until the filtrate measures 100 cc. Evaporate a 50-cc. aliquot of this filtrate to dryness in a suitable tared dish on a water bath and dry to constant weight at 110°. Calculate the percentage of this extractive from the weight of drug taken.

XIII—Petroleum Benzin-soluble Extractive—

Extract completely about 2 Gm. of the prepared drug (paragraph III), accurately weighed, by subjecting it during 20 hours to the action of petroleum benzin in a continuous extraction apparatus. Transfer the benzin solution to a tared porcelain dish and allow it to evaporate spontaneously. Then dry it over sulfuric acid for 18 hours and weigh. Calculate the percentage of this extractive from the weight of drug taken.

XIV—Non-volatile Ether-soluble Extractive—

Proceed as directed under *Volatile Ether-soluble Extractive* (paragraph XV). The weight of the extract after drying in a desiccator and then at 110° until of constant weight represents the non-volatile portion of the extract.

XV—Volatile Ether-soluble Extractive—

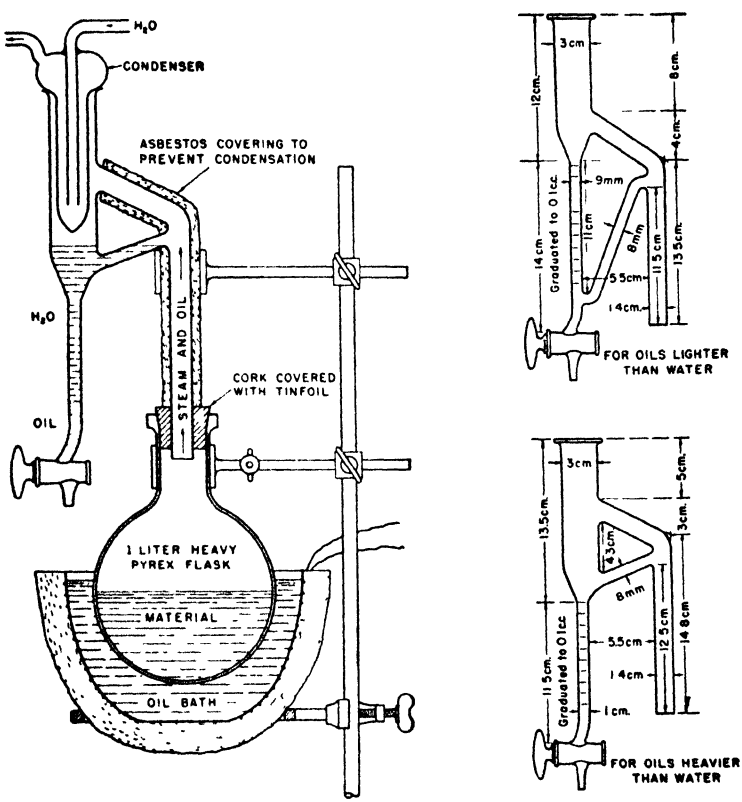
Extract 2 Gm. of the prepared drug (paragraph III), dried over sulfuric acid for not less than 12 hours, with absolute ether for 20 hours in a continuous extraction

apparatus. Transfer the ether solution to a tared porcelain dish and allow it to evaporate spontaneously. Then dry it over sulfuric acid during 18 hours and weigh the total ether extract. Now heat the extract gradually up to 110° until the weight becomes constant: the loss in weight represents the volatile portion of the extract.

XVI—Water-soluble Extractive—

Proceed as directed under paragraph XII, using water instead of diluted alcohol

XVII—Volatile Oil Determination—



Volatile Oil Apparatus

Set up an apparatus as shown in the illustration, using an appropriate volatile oil trap as illustrated. Use a suitable oil bath for heating

Weigh a sufficient quantity of the ground drug to yield, if possible, at least 2 cc. of the volatile oil, and place it in the round-bottomed flask. Add from 3 to 6 times as much water as the drug, and mix uniformly. Boil the contents of the flask slowly

during 4 to 8 hours, or until all the volatile oil has been distilled, taking care to avoid escape of vapors around the condenser.

With oils heavier than water, after the distillation is complete, transfer the oil to a graduated cylinder and draw off the water with any remaining oil into a small separator. Wash the oil trap with 10 cc. of ether, add the ether washings to the separator, shake and allow to separate. Draw off the water layer and discard it. Evaporate the ether layer until the odor of ether is no longer perceptible, then drain the residue of oil into the graduated cylinder, and note the volume of the oil at 25°.

If the oil content is to be determined by weight, add a small quantity of anhydrous sodium sulfate to the oil, agitate gently, decant the clear oil and determine its specific gravity at 25°.

Viscosity, Kinematic

Viscosity is a property which is closely related to the resistance to flow of a liquid. It is defined in terms of the force required to move one plane surface past another under specified conditions when the space between is filled by the liquid in question. It can be considered more simply as a relative property where water is the reference material and all viscosities are expressed in terms of the viscosity of pure water at 20°. The latter quantity is given as (very nearly) one *centipoise*, and a material ten times as viscous as water at this temperature has a viscosity of ten centipoises. The basic unit is the *poise;* for convenience, the *centipoise* (1 poise = 100 centipoises) is employed. The specifying of temperature is important because viscosity usually changes with temperature; in general, viscosity decreases as temperature is raised. While on the absolute scale viscosity is measured in poises or centipoises, it is more convenient to use the kinematic scale, in which the units are *stokes* and *centistokes* (1 stoke = 100 centistokes). The kinematic viscosity is obtained from the absolute viscosity by dividing the latter by the density of the liquid at the same temperature.

$$\text{Kinematic viscosity} = \frac{\text{absolute viscosity}}{\text{density}}$$

The sizes of the units are such that viscosities in the ordinary ranges are conveniently expressed in centipoises and centistokes. The magnitude of the viscosities of some common liquids at room temperatures may be indicated by the following relative figures:

Substance	*Approximate viscosity in centistokes*
Ether	0.2
Petroleum Benzin	0.6
Water	1
Kerosene	2.5
Liquid Petrolatum	20–70
Honey	10,000

Viscosity can be determined by any method which will measure the resistance to shear offered by the liquid. For ordinary liquids, it is customary to determine the time required for a given sample of the liquid to flow, at a regulated temperature, through a small capillary tube, and to compare this time with that required by the reference liquid, such as water. If the viscosity of the reference liquid is known, the kinematic viscosity of the unknown liquid may be calculated simply. Many capillary tube viscosimeters have been devised; nearly all are modifications of the Ostwald type. Several types are described, and directions for their use given, by the American Society for Testing Materials.*

Viscosity for commercial products is often expressed on arbitrary scales, and measured by empirical methods in special instruments. Thus semi-solids are often examined by so-called rotary instruments, which measure the resistance to rotation of a cylinder, placed concentrically within another, the annular space being filled with the sample. The viscosity of oils is expressed on arbitrary scales, which vary from one country to another, there being several corresponding instruments. The most widely used are:

England	—Redwood No. I and No. II
Germany	—Engler
United States	—Saybolt Universal
	Saybolt Furol

The Redwood No. II and the Saybolt Furol are designed for use with extremely viscous oils. This is done by providing a wider capillary for the measurement; the Saybolt Furol readings are approximately one-tenth those obtained on the same oil with the Saybolt Universal. Results for all the instruments are expressed in seconds of time required for outflow of a standard amount of liquid. Engler readings, however, may be reported as Engler degrees; these latter are obtained by dividing the efflux time for the sample by the corresponding efflux time for water in the same instrument and at the same temperature. Standard temperatures are adopted as a matter of convenience. For the Saybolt instruments, measurements are usually made at 100° and 210° F. Redwood measurements may be at several temperatures up to 250° F., and Engler degrees are usually reported at 20° and 50° C.

The determination of kinematic viscosity with modern instruments is more rapid and convenient than is the use of the Saybolt and similar equipment. The Ostwald pipette type viscosimeter is therefore displacing the metal capillary variety, although the Saybolt, Redwood, and Engler scales have been retained. Kinematic viscosities determined in the Ostwald pipettes are therefore converted to Saybolt and similar values by means of equations and conversion charts. The table on page 718 has been prepared by the American Society for Testing Materials.†

* A.S.T.M. D-445-42T; A.S.T.M. Standards on Petroleum Products and Lubri cants. Issued annually, Philadelphia, Pa.

† A.S.T.M., D-446-39, A.S.T.M. Standards on Petroleum Products and Lubricants, September (1940), issued annually, Philadelphia, Pa.

Values for Converting Kinematic Viscosity to Saybolt Universal Viscosity

Kinematic Viscosity, Centistokes	Equivalent Saybolt Universal Viscosity, Sec. (Basic Values, See Note) At 37.8° (100° F.)	At 54.4° (130° F.)	At 98.9° (210° F.)	Kinematic Viscosity, Centistokes	Equivalent Saybolt Universal Viscosity, Sec. (Basic Values, See Note) At 37.8° (100° F.)	At 54.4° (130° F.)	At 98.9° (210° F.)
2	32.6	32.7	32.8	31	145.3	145.6	146.3
2.5	34.4	34.5	34.6	32	149.7	150.0	150.7
3	36.0	36.1	36.3	33	154.2	154.5	155.3
3.5	37.6	37.7	37.9	34	158.7	159.0	159.8
4	39.1	39.2	39.4	35	163.2	163.5	164.3
4.5	40.7	40.8	41.0				
5	42.3	42.4	42.6				
6	45.5	45.6	45.8	36	167.7	168.0	168.9
7	48.7	48.8	49.0	37	172.2	172.5	173.4
8	52.0	52.1	52.4	38	176.7	177.0	177.9
9	55.4	55.5	55.8	39	181.2	181.5	182.5
10	58.8	58.9	59.2	40	185.7	186.1	187.0
11	62.3	62.4	62.7	41	190.2	190.6	191.5
12	65.9	66.0	66.4	42	194.7	195.1	196.1
13	69.6	69.7	70.1	43	199.2	199.6	200.6
14	73.4	73.5	73.9	44	203.8	204.2	205.2
15	77.2	77.3	77.7	45	208.4	208.8	209.9
16	81.1	81.3	81.7	46	213.0	213.4	214.5
17	85.1	85.3	85.7	47	217.6	218.0	219.1
18	89.2	89.4	89.8	48	222.2	222.6	223.8
19	93.3	93.5	94.0	49	226.8	227.2	228.4
20	97.5	97.7	98.2	50	231.4	231.8	233.0
21	101.7	101.9	102.4	55	254.4	254.9	256.2
22	106.0	106.2	106.7	60	277.4	277.9	279.3
23	110.3	110.5	111.1	65	300.4	301.0	302.5
24	114.6	114.8	115.4	70	323.4	324.0	325.7
25	118.9	119.1	119.7				
26	123.3	123.5	124.2	Over 70	Saybolt seconds = centistokes × 4.620	Saybolt seconds = centistokes × 4.629	Saybolt seconds = centistokes × 4.652
27	127.7	127.9	128.6				
28	132.1	132.4	133.0				
29	136.5	136.8	137.5				
30	140.9	141.2	141.9				

NOTE—To obtain the Saybolt Universal viscosity equivalent to a kinematic viscosity determined at t° F. multiply the equivalent Saybolt Universal viscosity at 100° F. by 1 + (t − 100) 0.000064; for example, 10 centistokes at 210° F. are equivalent to 58.8 × 1.0070 or 59.2 Saybolt Universal seconds at 210° F.

Vitamins A and D Assays

Definitions—As used herein, unless the context otherwise indicates, the term *assayer* means the individual immediately responsible for the interpretation of the

assay; the term *assay group* means the group of rats to which the assay oil shall be administered during the assay period; the term *assay oil* means the oil under examination for its vitamin potency; the term *assay period for the Vitamin A assay* means the interval in the life of a rat between the last day of the depletion period and the twenty-ninth day thereafter or between the last day of the depletion period and the death of the rat; the term *assay period for the Vitamin D assay* means the interval in the life of a rat between the last day of the depletion period and the eighth day thereafter; the term *assemble* means the procedure by which rats are selected and assigned to groups for the purpose of feeding, care, and observation; the term *control group* means the group of rats receiving no assay oil during the assay period; the term *daily*, for the Vitamin A assay, means 6 days of each week of the assay period; the term *daily*, for the Vitamin D assay, means each of the first 6 days of the assay period; the term *declining weight* means the condition of a rat when its body weight on any given day is equal to or less than the body weight of the rat on the seventh day prior to the given day; the term *depletion period* means the interval in the life of a rat between the last day of the preliminary period and the first day of the assay period; the term *dose* means the quantity of the Reference Oil or of the assay oil to be fed daily to a rat during the assay period; the term *fed* means made readily available to the rat or administered to the rat by mouth; the term *ground gluten* means the clean, sound product made from wheat flour by the almost complete removal of starch, and contains not more than 10 per cent of moisture, and, calculated on the water-free basis, not less than 14.2 per cent of nitrogen, not less than 15 per cent of nitrogen-free extract (using the protein factor 5.7), and not more than 5.5 per cent of starch (as determined by the diastase method*); the term *group for the Vitamin A assay* means six or more rats maintained on the same required dietary regimen during the assay period; the term *group for the Vitamin D assay* means seven or more rats maintained on the same required dietary regimen during the assay period; the term *ophthalmia* means a pathological state of the eye and/or the conjunctiva and/or the tissues anatomically related to the eye, readily discernible macroscopically and usually associated with Vitamin A deficiency; the term *preliminary period* means the interval in the life of a rat between the seventh day after birth and the first day of the depletion period; the term *rachitogenic diet* means a uniform mixture ot the food materials, and in the proportions named, in either of the following formulas:

Rachitogenic Diet No. 1	
Whole Yellow Maize, ground	33 per cent
Whole Wheat, ground	33 per cent
Ground Gluten	15 per cent
Gelatin	15 per cent
Calcium Carbonate (U. S. P.)	3 per cent
Sodium Chloride (U. S. P.)	1 per cent

Rachitogenic Diet No. 2	
Whole Yellow Maize, ground	76 per cent
Ground Gluten	20 per cent
Calcium Carbonate (U. S. P.)	3 per cent
Sodium Chloride (U. S. P.)	1 per cent

The term *Vitamin A test diet* means a food material consisting of the following proportions of the named ingredients of the quality specified:

* Official and Tentative Methods of Analysis, Association of Official Agricultural Chemists, sixth edition, 1945, page 410, method II: page 577, method 34.53

Vitamin A Test Diet

Casein	18 per cent
Salt Mixture (see page 720)	4 per cent
Yeast, dried	8 per cent
Starch	65 per cent
Vegetable Oil	5 per cent
Vitamin D, a sufficient amount	

Not less than 3 U. S. P. Units of Vitamin D shall be provided in each gram of diet and this vitamin shall be carried by the yeast or the vegetable oil. The ingredients of the Vitamin A test diet shall be free from Vitamin A or shall have been treated so as to reduce the Vitamin A content to such a degree that when the Vitamin A test diet is fed to the control group two-thirds or more of the rats shall manifest, prior to the eleventh day of the assay period, symptoms of Vitamin A deficiency characterized by both declining weight and ophthalmia. The dried yeast shall carry the Vitamin B complex in such concentration that a daily dose of 0.15 Gm. shall permit an average gain in weight of at least 3 Gm. per week in rats during an interval of 4 weeks between the twenty-fifth and sixtieth days of age, at which time the rats are provided ad libitum with a ration which is adequate for optimal growth, except that the ration shall be devoid of the Vitamin B complex.

Salt Mixtures

For preparing the salt mixtures, the available form of each chemical is taken to furnish the stipulated equivalent of each chemical.

Salt Mixture No. 1

Calcium Carbonate (U. S. P.)	134.8	Gm.
Magnesium Carbonate (U. S. P.)	28.9	Gm.
Sodium Carbonate, anhydrous (U. S. P. Reagent)	34.2	Gm.
Potassium Carbonate (U. S. P., dried at 180° C.)	141.3	Gm.
Phosphoric Acid (U. S. P., 86.5 per cent)	119.3	Gm.
Hydrochloric Acid (U. S. P., 36.5 per cent)	148.3	Gm.
Sulfuric Acid (U. S. P., 96 per cent)	9.6	Gm.
Citric Acid (U. S. P.)	111.1	Gm.
Ferric Citrate (U. S. P. Reagent)	7.44	Gm.
Potassium Iodide (U. S. P.)	0.020	Gm.
Manganese Sulfate (U. S. P. Reagent)	0.117	Gm.
Sodium Fluoride (U. S. P. Reagent)	0.062	Gm.
Potassium Alum (U. S. P.)	0.044	Gm.

Dissolve the citric acid in a sufficient quantity of hot distilled water and add the solution to the mixed carbonates. Then add the potassium iodide, manganese sulfate, sodium fluoride, and potassium alum, previously dissolved in distilled water. Then add the ferric citrate dissolved in the hydrochloric acid. Dilute the sulfuric acid with distilled water, add the phosphoric acid, and add this acid mixture to the mixture previously prepared and stir until effervescence ceases. Evaporate the

final mixture to dryness in a current of air at 90° to 100°, and reduce the resulting product to a fine powder.

NOTE—A salt mixture may also be prepared by combining suitable quantities of chemical compounds of such degree of purity as to produce a mixture having essentially the same proportions of the same elements as Salt Mixture No. 1.

Salt Mixture No. 2

Sodium Chloride (U. S. P.)	1.73 Gm.
Magnesium Sulfate (U. S. P.)	5.45 Gm.
Sodium Biphosphate (U. S. P.)	3.47 Gm.
Potassium Phosphate (U. S. P. Reagent)	9.54 Gm.
Calcium Biphosphate (U. S. P. Reagent)	5.40 Gm.
Ferric Citrate (U. S. P. Reagent)	1.18 Gm.
Calcium Lactate (U. S. P.)	13 Gm.

Mix the finely powdered salts uniformly.

The assay of an oil for Vitamin A and Vitamin D potency shall be by comparison with the U. S. P. Vitamin A Reference Standard and U. S. P. Vitamin D Reference Standard, respectively, by assay procedures conforming in all respects to the following specifications:

Method of Assay for Vitamin A

The Vitamin A assay, comprising the recording of observations of groups of rats throughout specified periods of their lives, while being maintained on specified dietary regimens, and the interpretation of such data, are as follows:

Preliminary Period—Throughout the preliminary period each rat shall be raised under the immediate supervision of, or according to directions specified by, the assayer. Throughout the preliminary period the rats shall be maintained on a dietary regimen which shall provide for normal development in all respects, except that the supply of Vitamin A, or precursors of Vitamin A, shall be limited to such a degree that rats weighing between 40 and 50 Gm. and not exceeding 28 days of age and subsisting on a suitable Vitamin A deficient ration and water for an interval not exceeding 45 days shall manifest symptoms characteristic of Vitamin A deficiency.

Depletion Period—A rat shall be suitable for the depletion period when the age of the rat does not exceed 28 days, and if the body weight of the rat shall exceed 39 Gm., and does not exceed 50 Gm., and if the animal manifests no evidence of injury, or disease, or anatomical abnormality which might hinder growth and development. Throughout the depletion period each rat shall be provided with the Vitamin A test diet and water (U. S. P.), ad libitum, and during this period no other dietary supplement shall be available to the animal.

Assembling Rats into Groups for the Assay Period—Rats which are suitable for the assay period shall be assembled into groups. For each assay oil there shall be one or more assay groups. In the assay of one assay oil there shall be provided at least one control group and at least one reference group, but one control group and one reference group may be used for the concurrent assay of more than one assay oil. The interval of assembling rats into groups shall not exceed 60 days. On any one day during the interval of assembling rats into groups, the total number of rats that

shall have been assigned to make up any one group shall not exceed by more than two the number of rats that shall have been assigned to make up any other group. When the assembling of all groups shall have been completed, the total number of rats in each group shall be the same, and the number of rats of one sex in each group shall be the same. Not more than three rats from one litter shall be assigned to one group. When the assembling of all groups shall have been completed, the average weight of the rats in any one group on the day beginning the assay period shall not exceed by more than 10 Gm. the average weight of the rats in any other group on the day beginning the assay period.

Assay Period—A rat shall be suitable for the assay period, provided that the depletion period shall have exceeded 20 days and shall not have exceeded 45 days, and provided that a rat shall manifest evidence of Vitamin A deficiency characterized by declining weight and/or ophthalmia. Throughout the assay period each rat of the control, reference, and assay groups shall be kept in an individual cage and shall be provided with the Vitamin A test diet and water (U. S. P.), ad libitum. Throughout the assay period each rat in any assay group shall be fed daily a dose of the assay oil, and throughout the assay period each rat in any one reference group shall be fed daily a dose of the reference oil. The reference oil and/or the assay oil may be diluted before feeding with an edible vegetable oil free from Vitamin A. Diluted oil shall be stored in the dark at a temperature not exceeding 10° C. The period of storage shall not exceed 7 days. Not more than 0.1 cc. of the diluted oil shall be fed as a daily dose. During the assay period all conditions of environment shall be maintained as uniformly as possible with respect to the assay, reference, and control groups.

Recording of Data—On the day beginning the depletion period and at intervals of not more than 7 days for the first 21 days of that period, there shall be a record made of the body weight of each rat. From the twenty-first day of the depletion period until the end of the assay period a record shall be made of the body weight and eye condition of each rat at intervals not exceeding 5 days. The eye condition shall be designated as normal, watery, sensitive to light, swollen, bloody exudate, purulent, opacity of cornea, or any combination of these terms. A record shall be made of the failure of a rat to consume the prescribed daily dose of reference or assay oil.

Vitamin A Potency of the Assay Oil—In determining the Vitamin A potency of the assay oil, the performance of the rats of the assay and reference groups shall be calculated for each group on the basis of the difference between the average weight of the surviving rats and the average weight of the same rats on the day beginning the assay period. The data from the reference group shall be considered valid for establishing the Vitamin A potency of the assay oil only when two-thirds or more of the total number of animals comprising a reference group shall have made individually between the beginning day of the assay period and the twenty-eighth day thereafter an increase in body weight which shall equal or exceed 12 Gm. and shall not exceed 60 Gm., and the data from an assay or reference group shall be considered valid for establishing the Vitamin A potency of the assay oil only when two-thirds or more, but not less than 6, of the rats of an assay or reference group have survived 28 days of the assay period. The data from an assay group shall be considered valid for establishing the Vitamin A potency of an assay oil only when two-thirds or more, but not less than 6 rats, shall have made individually between the beginning day of the assay period and the twenty-eighth day thereafter an increase in body weight which

shall equal or exceed 12 Gm. The data from a rat shall be considered valid for establishing the average performance of a reference or assay group only on the condition that the rat has consumed the prescribed dose of oil for at least 22 days of the assay period. A Vitamin A assay shall not be considered valid unless two-thirds or more of the total number of animals comprising the control group shall, prior to the eleventh day of the assay period, manifest symptoms of Vitamin A deficiency characterized by both declining weight and ophthalmia.

Calculation of Vitamin A Potency

Minimum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average gain in weight, G, of not less than 12 Gm. and not more than 60 Gm.

Let A equal the daily dose in milligrams of the assay oil that will produce in an assay group an average gain in weight equal to or greater than G.

If the product of $\left(\frac{R}{A}\right) x$ (units per Gm. of Vitamin A contained in the reference oil) is equal to or greater than the minimum standard in U. S. P. units per Gm. for the oil assayed, then the assay oil meets the minimum standard for Vitamin A potency.

Maximum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average gain in weight, G, of not less than 12 Gm. and not more than 60 Gm.

Let A equal the daily dose in milligrams of the assay oil that will produce in an assay group an average gain in weight equal to or greater than G.

If the product of $\left(\frac{R}{A}\right) x$ (units per Gm. of Vitamin A contained in the reference oil) is equal to or less than the maximum standard in the U. S. P. units per Gm. for the oil assayed, then the assay oil meets the maximum standard for Vitamin A potency.

Method of Assay for Vitamin D

The Vitamin D assay, comprising the recording of observations of groups of rats, throughout specified periods of their lives, while being maintained on specified dietary regimens, and the interpretation of such data, is as follows:

Preliminary Period—Throughout the preliminary period each rat shall be raised under the immediate supervision of, or according to directions specified by, the assayer. Throughout the preliminary period the rats shall be maintained on a dietary regimen which shall provide for normal development in all respects, except that the supply of Vitamin D shall be limited to such a degree that rats, weighing between 40 and 60 Gm. at an age of 21 to 30 days, and subsisting for an interval of 3 weeks on a suitable rachitogenic diet, shall manifest evidence of severe rickets.

Depletion Period—A rat shall be suitable for the depletion period when the age of the rat does not exceed 30 days, and if the body weight of the rat shall exceed 44 Gm., and does not exceed 60 Gm., and if the animal manifests no evidence of injury, or disease, or anatomical abnormality which might hinder growth and development. Throughout the depletion period each rat shall be provided with the rachitogenic diet

and water (U. S. P.), ad libitum, and during this period no other dietary supplement shall be available to the animal.

Assembling Rats into Groups for the Assay Period—Rats which are suitable for the assay period shall be assembled into groups. For each assay oil there shall be one or more assay groups. In the assay of one assay oil there shall be provided at least one reference group, but one reference group may be used for the concurrent assay of more than one assay oil. The interval of assembling rats into groups shall not exceed 60 days. On any one day during the interval of assembling rats into groups, the total number of rats that shall have been assigned to make up any one group shall not exceed by more than two the number of rats that shall have been assigned to make up any other group. When the assembling of all groups shall have been completed, the total number of rats in each group shall be the same. Not more than three rats from one litter shall be assigned to the assay group unless an equal number of rats from the same litter are assigned to the reference group. When the assembling of all groups shall have been completed, the average weight of the rats in any one group of the day beginning the assay period shall not exceed by more than 8 Gm. the average weight of the rats in any other group on the day beginning the assay period.

Assay Period—A rat shall be suitable for the assay period, provided that the depletion period shall have exceeded 18 days and shall not have exceeded 25 days, and provided that a rat shall manifest evidence of rickets characterized by a distinctive, wabbly, rachitic gait and by enlarged joints. The presence of rickets may also be established by examination of a leg bone of one member of a litter by the "line test" described below. Each rat shall be kept in an individual cage and shall be provided with the rachitogenic diet and water (U. S. P.), ad libitum. On any calendar day of the assay period, the assay and reference groups shall receive a rachitogenic diet compounded from the same lots of ingredients. Throughout the first 6 days of the assay period, each rat in any one assay group shall be fed daily a dose of the assay oil, and throughout the first 6 days of the assay period each rat in any one reference group shall be fed daily a dose of the reference oil, except that the following deviation from the daily feeding shall be permissible: that the daily dose may be doubled on the day preceding a one-day holiday falling within the first 6 days of the assay period. During the remainder of the assay period neither the assay oil nor the reference oils shall be fed. At the termination of the assay period, each rat shall be killed and one or more leg bones examined for healing of the rachitic metaphysis according to the "line test" described below. The reference oil and/or the assay oil may be diluted before feeding with an edible vegetable oil free from Vitamins A and D. The diluted oil shall be stored in the dark at a temperature not exceeding 10°, the storage period not to exceed 30 days. Not more than 0.1 cc. of the diluted oil shall be fed as a daily dose. During the assay period all conditions of environment (particularly with reference to physiologically active radiations) shall be maintained as uniformly as possible with respect to the assay and reference groups.

Line Test—The line test shall be made on the proximal end of a tibia or distal end of a radius or ulna. The end of the desired bone is removed from the animal and cleaned of adhering tissue. A longitudinal median section shall be made through the end of the bone with a clean, sharp blade to expose a plane surface through the junction of the epiphysis and diaphysis. In any one assay the same bone of all the

animals must be used and sectioned through the same plane. Both sections of the bone shall be rinsed in distilled water and shall then immediately be immersed in a 2 per cent aqueous solution of silver nitrate for 1 minute. The sections shall then be rinsed in distilled water and the sectioned surfaces of the bone shall be exposed in water to daylight or other source of actinic light until the calcified areas have developed a clearly defined stain without marked discoloration of the uncalcified areas.

Records shall be made immediately of the extent and degree of calcification of the rachitic metaphysis of every section. It shall be permissible to use modifications of the described procedure for staining, provided that such modified procedures clearly differentiate between calcified and uncalcified areas.

Recording of Data—On the day beginning the assay period and on the seventh day thereafter, a record shall be made of the body weight of each rat. A record shall be made of the quantity of rachitogenic diet consumed per rat during the assay period. Numerical values shall be assigned to the extent and degree of calcification of the rachitic metaphysis of the bones examined by the line test so that it will be possible to average the performance of each group.

Vitamin D Potency of the Assay Oil—In determining the Vitamin D potency of the assay oil, the average performance of groups with respect to healing of the rachitic metaphysis shall be considered, provided that the average performance of a reference group with respect to calcification of the rachitic metaphysis shall be determined by the data from rats which individually show an extent and degree of calcification in the rachitic metaphysis as determined by the line test equal to or greater than a condition described as a positive macroscopic evidence of calcification, but less than an extent and degree of calcification described as complete healing. The data from a reference group shall be considered valid for establishing the Vitamin D potency of the assay oil only when two-thirds or more, but not less than seven rats, show individually an extent and degree of calcification of the rachitic metaphysis equal to or greater than a condition described as positive macroscopic evidence of calcification, but less than an extent and degree of calcification described as complete healing. The data from an assay group shall be considered valid for establishing the Vitamin D potency of an assay oil only when two-thirds or more, but not less than seven rats, show individually an extent and degree of calcification of the rachitic metaphysis equal to or greater than a condition described as positive macroscopic evidence of calcification. The data from a rat shall be considered valid for establishing the average performance of a group only on the condition that the weight of the rat at the termination of the assay period shall equal or exceed the weight of the rat on the beginning day of the assay period and that the rat has consumed 28 Gm. or more of the rachitogenic diet during the assay period and on the condition that the rat has consumed each prescribed dose of assay oil within 24 hours from the time it was fed.

Calculation of Vitamin D Potency

Minimum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average extent and degree of calcification C not less than a condition described as positive macroscopic evidence of calcification but less than an extent and degree of calcification described as complete healing.

Let A equal the daily dose in milligrams of the assay oil that will produce in an

assay group an average extent and degree of calcification equal to or greater than C

If the product of $\left(\frac{R}{A}\right) x$ (units per Gm. of Vitamin D contained in the reference oil) is equal to or greater than the minimum standard in U. S. P. units per Gm. for the oil assayed, then the assay oil meets the minimum standard for Vitamin D potency.

Maximum Standard—

Let R equal the daily dose in milligrams of the reference oil necessary to produce in a reference group an average extent and degree of calcification C not less than a condition described as positive macroscopic evidence of calcification but less than an extent and degree of calcification described as complete healing.

Let A equal the daily dose in milligrams of the assay oil that will produce in an assay group an average extent and degree of calcification equal to or greater than C.

If the product of $\left(\frac{R}{A}\right) x$ (units per Gm. of Vitamin D contained in the reference oil) is equal to or less than the maximum standard in U. S. P. units per Gm. for the oil assayed, then the assay oil meets the maximum standard for Vitamin D potency.

Waters

(Aromatic Waters)

Aromatic waters are saturated solutions (unless otherwise specified) of volatile oils or other aromatic or volatile substances in distilled water. Their odors and tastes are similar, respectively, to those of the drugs or volatile substances from which they are prepared, and they are free from empyreumatic and other foreign odors.

Aromatic waters may be prepared by one of the following processes:

(a) **Distillation**—Place the odoriferous portion of the plant or drug from which the aromatic water is to be prepared in a suitable still with sufficient distilled water, and distil most of the water, carefully avoiding the development of empyreumatic odors through the charring or scorching of the substances. Separate the excess of oil, and preserve or use the clear water portion, filtering if necessary.

(b) **Solution**—

The Volatile Oil, or Other Specified Volatile Substance	2 cc. or 2 Gm.
Distilled Water, a sufficient quantity,	
To make	1000 cc.

Shake the volatile substance (suitably comminuted if a solid) with 1000 cc. of distilled water in a capacious bottle, and repeat the shaking several times during a period of about 15 minutes. Set the mixture aside for 12 hours or longer, filter through wetted filter paper, and pass enough distilled water through the filter to make the product measure 1000 cc.

Alternative Solution Method—Thoroughly incorporate the volatile oil (or the suitably comminuted volatile solid) with 15 Gm. of talc or with a sufficient quantity of purified siliceous earth or pulped filter paper. Add 1000 cc. of distilled water, and thoroughly agitate the mixture several times during 10 minutes. Then filter the mixture, returning the first portions, if necessary, to obtain a clear filtrate, and add enough distilled water through the filter to make the product measure 1000 cc.

Packaging and Storage. Protect aromatic waters from intense light and excessive heat.

Zinc in Insulin Injection

Transfer from 2 to 10 cc. of Insulin Injection to a centrifuge tube of suitable capacity. Add 1 drop of diluted hydrochloric acid, or sufficient to obtain a clear solution, and 0.5 cc. of 10 per cent (w/v) trichloroacetic acid for each cc. of the preparation used. Mix thoroughly, centrifuge the mixture, and decant the supernatant liquid. Wash the residue with 5 cc. of 4 per cent (w/v) trichloroacetic acid, again centrifuge the mixture, and decant the supernatant liquid. To the combined supernatant liquids in a centrifuge tube, add stronger ammonia T.S., dropwise, until the reaction is alkaline to litmus, then add 1 cc. of ammonium acetate solution, made by dissolving 154 Gm. of ammonium acetate in sufficient water to make 1000 cc.

Stir, and add from 1 to 2 cc. of double-normal acetic acid. Saturate the mixture with hydrogen sulfide, allow to stand over night, and centrifuge. Dissolve the precipitate in approximately 1 cc. of hot diluted hydrochloric acid, transfer the solution quantitatively to a flask, and evaporate to dryness. Introduce 5 cc. of fiftieth-normal sulfuric acid slowly along the side of the warmed flask, and follow with 10 cc. of water and 1 cc. of sodium phosphate solution (made by diluting 50 cc. of reagent phosphoric acid with about 300 cc. of water, then adding such an amount of a 10 per cent solution of sodium hydroxide that, when diluted with sufficient water to make 1000 cc., the pH of the solution is not less than 2.8 and not more than 3.2). Boil the liquid for 2 minutes, and allow to cool to room temperature. Add 1 cc. of starch T.S. and 1 cc. of freshly prepared potassium iodide solution, made by dissolving 1 Gm. of potassium iodide in 10 cc. of water. If a blue color appears in the solution within 1 minute, indicating the presence of iodine, add thousandth-normal sodium thiosulfate dropwise, until the solution is colorless. Add 1 cc. of freshly prepared potassium ferricyanide solution, made by dissolving 100 mg. of potassium ferricyanide in 10 cc. of water, stir, and allow to stand for a uniform period of from 1 to 5 minutes. Titrate rapidly the liberated iodine with thousandth-normal sodium thiosulfate until the color changes from deep blue to greenish yellow. The titration is complete when 1 drop of the reagent changes the color of the solution from greenish yellow to yellow. Each cc. of thousandth-normal sodium thiosulfate is equivalent to 0.10 mg. of zinc. Concurrently with the analysis of the sample, apply the same procedure to a suitable volume of standard zinc sulfate solution, made by weighing accurately 125 mg. of zinc oxide, previously gently ignited to constant weight, and dissolving it by warming with 4 cc. of normal sulfuric acid, then diluting with sufficient water to make 1000 cc., each cc. of the solution thus containing 0.10 mg. of zinc (Zn), and make the appropriate correction for incomplete recovery of zinc.

REAGENTS, TEST SOLUTIONS, COLORIMETRIC SOLUTIONS, INDICATORS, VOLUMETRIC APPARATUS, VOLUMETRIC SOLUTIONS, HYDROGEN IONS, AND pH

Reagents are substances used in chemical testing or microscopic examination, either as such or as constituents of test solutions.

Test Solutions, abbreviated "T.S.," are solutions of reagents in such solvents and of such definite concentrations as to make them most suitable for their intended use in qualitative or quantitative analysis.

Indicators are reagents or test solutions used to determine when a certain desired point in a chemical reaction has been obtained, or to measure hydrogen ion concentration (pH).

Volumetric Solutions, also known as **Standard Solutions**, are solutions of reagents of known concentration intended primarily for use in quantitative determinations. Their concentrations are usually expressed in terms of normality.

Colorimetric Solutions, abbreviated "C.S.," are used in the preparation of colorimetric standards and are employed as a basis of comparison in a number of chemical tests.

Some official substances which comply with the tests for purity given in the monographs of the U. S. P. are satisfactory for use as reagents or test solutions. When a substance is not official, or when a greater degree of purity is required than is provided for in the monograph, the substance will be found in the following list with the necessary description and tests to insure its suitability for the purpose intended.

Reagents, test solutions, volumetric solutions, colorimetric solutions, and indicator solutions should be preserved in containers made of glass of a minimum solubility and alkalinity, and as free from lead and arsenic as practicable. The containers must be capable of being tightly closed. When reagents or test solutions are affected by light, the directions to keep them in light-resistant containers should be carefully observed.

When stoppers made of glass or other materials are used in bottles or other apparatus which are to contain substances capable of attacking or penetrating such surfaces, a protective coating of a thin film of petrolatum may be applied unless other specific directions are given.

Reagent Acids and Ammonia—When hydrochloric acid, diluted hydrochloric acid, ammonia, or ammonia T.S. are directed to be used in the testing of official substances or reagents, the reagent grade of these products is to be used unless otherwise indicated.

Water—When water is mentioned in the tests for reagents or in preparing test solutions, etc., distilled water is always to be used.

Reagents

General Tests for Purity of Reagents

The following general methods of testing are intended to be used in the examination of *Reagents* only, and, except when otherwise directed, they are applied as described below.

Insoluble—The quantity of reagent specified in the test is dissolved in 100 cc. of hot water, unless otherwise directed, in a covered beaker and warmed on a water bath for 1 hour. If any insoluble residue remains, the solution is filtered through counterbalanced filter papers, through a tared, suitable crucible with an asbestos mat, or through a tared sintered-glass crucible. The filter is washed thoroughly with hot water, dried at from 105° to 110°, and weighed.

Chloride in Reagents—A solution of the quantity of the reagent indicated in the test in 25 cc. of water, or a solution prepared as directed in the test, is neutralized, if alkaline, with nitric acid, using litmus paper as the indicator, and 3 cc. of nitric acid added. The solution is filtered, if necessary, through a filter paper previously washed with water until the paper is free of chloride, and 1 cc. of silver nitrate T.S. added. After mixing well, it is allowed to stand for 5 minutes protected from direct sunlight. The turbidity, if any, is compared with that produced in a control test made with the same quantities of the same reagents as in the final test and a volume of a standard sodium chloride solution equivalent to the quantity of chloride (Cl) permitted by the test. Both solutions are adjusted to the same volume with water before adding the silver nitrate T.S., and the glass cylinders in which the turbidities are compared must match in internal diameter and in all other respects as closely as possible.

The *standard sodium chloride solution* is made by dissolving 164.8 mg. of sodium chloride in sufficient water to make exactly 1000 cc. It contains the equivalent of 0.10 mg. of chlorine (Cl) in each cc.

In *testing barium salts*, the solution containing the reagent is neutralized, if alkaline, with nitric acid, and only 3 drops more of nitric acid added. The remainder of the test is carried out as described above.

In *testing salts giving colored solutions*, dissolve 2 Gm. of the reagent in 25 cc. of water and add 3 cc. of nitric acid. The solution is filtered, if necessary, through a filter paper previously washed with water, and the filtrate divided into 2 equal portions. One portion is treated with 1 cc. of silver nitrate T.S. and allowed to stand for 10 minutes, and, if any turbidity is produced, it is filtered through a washed filter paper until clear and the filtrate used as a blank. The other portion is treated with 1 cc. of silver nitrate T.S. and, after mixing well and allowing to stand for 5 minutes protected from direct sunlight, the turbidity is compared with that produced in the blank by the addition of a volume of the standard sodium chloride solution equivalent to the quantity of chloride (Cl) permitted in the test, both solutions being adjusted to the same volume with water.

Sulfate in Reagents—A solution of the quantity of the reagent indicated in the test in 25 cc. of water, or a solution prepared as directed in the test, is neutralized, if alkaline, with hydrochloric acid, using litmus paper as the indicator, and 1 cc. of normal hydrochloric acid is added. The solution is filtered, if necessary, through a filter paper previously washed with water, and then 2 cc. of barium chloride T.S. is

added. After being well mixed, it is allowed to stand for 10 minutes, and the turbidity, if any, is compared with that produced in a control test containing the same quantities of the same reagents used in the test and a quantity of a standard potassium sulfate solution equivalent to the quantity of sulfate (SO_4) permitted in the test. Both solutions are adjusted to the same volume with water before adding the barium chloride T.S. and the glass cylinders in which the turbidities are compared must match in internal diameter and in all other respects as closely as possible.

The *standard potassium sulfate solution* is made by dissolving 181.4 mg. of potassium sulfate in sufficient water to make 1000 cc. It contains the equivalent of 0.10 mg. of sulfate (SO_4) in each cc.

Heavy Metals in Reagents—Dissolve the quantity of the reagent indicated in the text in 20 to 25 cc. of water, add 2 cc. of diluted acetic acid, then dilute with water to 30 cc. Transfer the solution completely to a Nessler tube or prepare in the tube.

In a Nessler tube closely matching that used for the sample, prepare a control solution with a volume of *standard lead solution*, page 657, equivalent to the limit for heavy metals in the quantity of the reagent directed to be taken for the test, 2 cc. of diluted acetic acid, and sufficient water to make 30 cc. Then to each of the Nessler tubes add 10 cc. of hydrogen sulfide T.S., mix well, and observe the color after 5 minutes. Any color produced in the tube with the reagent is not darker than that with the control, the solutions being viewed downward against a white surface.

When the reagent is an acid salt, or when the solution prepared for the heavy metals test is acid, add 1 or 2 drops of phenolphthalein T.S. to the solution, followed by ammonia T.S. until the solution acquires a slight pink color, then add 2 cc. of diluted acetic acid and dilute with water to 30 cc.

If the solution after testing for *heavy metals* is to be used for the test for iron, render the original solution neutral to litmus paper instead of to phenolphthalein T.S.

When the reagent is an alkali salt of an organic acid, use 2 cc. of normal hydrochloric acid in the test instead of the diluted acetic acid, unless otherwise specified.

Except when otherwise directed, if using more than 1 cc. of hydrochloric acid or its equivalent of diluted hydrochloric acid, or more than 2 cc. of ammonia T.S. in preparing the sample for the heavy metals test, prepare the control test as follows: evaporate the same quantity of the hydrochloric acid or the ammonia as used in the test with the sample in porcelain or glass to dryness on a steam bath. Add to the residue 2 cc. of diluted acetic acid and a few cc. of warm water, then add the required volume of the standard lead solution, and dilute with water to 30 cc.

Iron in Reagents—When a limit for iron is included, it is determined as follows, except when otherwise directed: The solution from the test for *Heavy Metals in Reagents* is filtered, if necessary, and rendered distinctly alkaline to litmus paper by the addition of ammonia T.S. The greenish color produced, if any, is not greater than that produced in a control test made by adding to the blank prepared in the test for *Heavy Metals in Reagents* a quantity of a standard solution of ferric ammonium sulfate equivalent to the quantity of iron permitted in the test, and alkalinized with the same volume of ammonia T.S. as used in the test, both solutions being adjusted to the same volume with water.

The *standard solution of ferric ammonium sulfate* is prepared by dissolving 863.4 mg. of ferric ammonium sulfate in water, adding 10 cc. of diluted sulfuric acid and diluting to 1000 cc. It contains the equivalent of 0.10 mg. of iron (Fe) in each cc.

Standard Phosphate Solution—Dissolve 143.3 mg. of potassium biphosphate in sufficient water to make 1000 cc. Each cc. of the solution represents 0.1 mg. of PO_4.

Reagent Standards

Standards for the quality of the reagents in this chapter are based upon the purity required for the proper performance of the tests and assays in the Pharmacopœia.

Acacia—Use *Acacia*, page 11.

Acetic Acid, $CH_3.COOH$—A clear, colorless liquid having a characteristic odor and a sharply acid taste; miscible with water, alcohol, or glycerin.

Assay—Place about 6 cc. in a tared, glass-stoppered flask, and weigh accurately. Dilute with 40 cc. of water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 60.05 mg. of CH_3COOH. Not less than 36 and not more than 37 per cent is found.

Non-volatile—Evaporate 20 cc. in a tared porcelain dish on a steam bath and dry at 105° for 2 hours: the weight of the residue does not exceed 1 mg. (0.005 per cent).

Chloride—The chloride in 5 cc. corresponds to not more than 0.01 mg. of Cl (0.0002 per cent), page 729.

Sulfate—The sulfate in 10 cc. corresponds to not more than 0.05 mg. of SO_4 (0.0005 per cent).

Heavy metals—Evaporate 5 cc. to dryness on a steam bath. Warm the residue with 2 drops of diluted hydrochloric acid, dilute with 30 cc. of water, and add 10 cc. of hydrogen sulfide T.S. The heavy metals limit for acetic acid is 5 parts per million.

Substances reducing permanganate—Mix 6 cc. with 4 cc. of water, add to the mixture 0.1 cc. of tenth-normal potassium permanganate and let stand at 20° to 25° for 2 hours. At the end of this time, the pink color is not entirely changed to brown.

Acetic Acid, Diluted—Dilute 60.0 cc. of glacial acetic acid with sufficient water to make 1000 cc.

Non-volatile—Evaporate 50 cc. on a steam bath to dryness and dry the residue at 105° for 2 hours. The weight of the residue does not exceed 1.0 mg. (0.002 per cent).

Heavy metals—Evaporate 20 cc. in porcelain nearly to dryness on a steam bath. Add to the residue 2 cc. of the acid and dilute with water to 25 cc.; then add 10 cc. of hydrogen sulfide T.S. Any dark color produced is not darker than a control made with 0.04 mg. of Pb and 2 cc. of the diluted acetic acid (2 parts per million).

Chloride, sulfate—Diluted acetic acid, without further dilution, conforms to the tests for *chloride* and *sulfate* given under *Acetic Acid*, page 731.

Acetic Acid, Glacial, CH_3 COOH—Use *Glacial Acetic Acid*, page 13.

Acetic Anhydride, $(CH_3CO)_2O$—A colorless liquid, possessing a pungent odor. Boils at about 140°.

Assay—Weigh accurately about 2 Gm. in a 200-cc. glass-stoppered Erlenmeyer flask, cool in ice, add 5 cc. of freshly distilled aniline, immediately stopper, shake vigorously. and allow to stand at room temperature for 30 minutes. Add 50 cc. of ice cold water, pouring it in so as to rinse down the sides of the flask; mix well and

titrate with normal alkali, using 3 drops of phenolphthalein T.S. as the indicator. The titration should be carried to a point where the red color persists after standing for 10 minutes.

In a second flask weigh accurately about 2 Gm. of the acetic anhydride, add 50 cc. of water, allow to stand for 30 minutes, and titrate with normal alkali to the same end-point, with phenolphthalein as the indicator. Calculate the number of cc. of alkali used in each of the titrations to the basis of 1 Gm. of the anhydride. The difference between the two calculated titrations, multiplied by 2, is the number of cc. of normal alkali equivalent to the anhydride in 1 Gm. of the acetic anhydride assayed, and corresponds to not less than 96 per cent of $(CH_3CO)_2O$. Each cc. of normal sodium hydroxide is equivalent to 51.04 mg. of $(CH_3CO)_2O$.

Non-volatile—Evaporate 30 cc. on a water bath and dry at from 105° to 110° to constant weight: the weight of the residue should not exceed 1.0 mg. (0.003 per cent).

Chloride—The chloride in 5 cc. of acetic anhydride corresponds to not more than 0.025 mg. of Cl (0.0005 per cent), page 729.

Phosphate—Evaporate 10 cc. on a water bath. Dissolve the residue in 10 cc. of nitric acid and dilute with 50 cc. of water. Nearly neutralize with ammonia T.S., cool slightly, add 50 cc. of ammonium molybdate T.S., shake it at about 40° for 5 minutes, and allow to stand for 30 minutes. Any precipitate formed should not be greater than is produced when 1 cc. of standard phosphate solution, page 731, is treated as in the test (0.001 per cent PO_4).

Sulfate—To 30 cc. of acetic anhydride add 25 cc. of water and 10 mg. of anhydrous sodium carbonate; evaporate to dryness on a water bath: the residue shows no more sulfate than corresponds to 0.15 mg. of SO_4 (0.0005 per cent), page 729.

Heavy metals—Dissolve 2.7 cc. (3 Gm.) in 10 cc. of water and evaporate on a steam bath to dryness. Warm the residue with 2 cc. of diluted acetic acid and 10 cc. of water and dilute to 30 cc. The heavy metals limit of acetic anhydride is 5 parts per million, page 730.

Substances reducing permanganate—Dissolve 2 cc. of the anhydride in 10 cc. of water and add 0.4 cc. of tenth-normal potassium permanganate. At the end of 5 minutes the pink color should not be entirely discharged.

Keep in glass-stoppered bottles in a cool, dry place. The stoppers should be sealed with paraffin.

Acetone (*Dimethyl Ketone*) $CH_3.COCH_3$—A transparent, colorless, mobile and volatile liquid; it is miscible, without cloudiness, with water, alcohol, ether, and chloroform; a characteristic odor.

Specific gravity—Not above 0.785.

Boiling range—It distils between 56° and 57°.

Non-volatile—Evaporate 100 cc. in a tared porcelain dish on a water bath, and dry the residue for 2 hours at 105°; the weight of the residue does not exceed 1 mg.

Acidity—Mix 25 cc. with 25 cc. of carbon dioxide-free water and add 2 drops of phenolphthalein T.S.: not more than 0.25 cc. of fiftieth-normal sodium hydroxide is required to produce a pink color.

Alkalinity—Mix 25 cc. with 25 cc. of water and add 1 drop of methyl red T.S. Any yellow color formed is changed to pink by the addition of not more than 0.1 cc. of tenth-normal sulfuric acid.

Readily oxidizable substances—Mix 20 cc. with 0.1 cc. of tenth-normal potassium

permanganate in a glass-stoppered bottle: the pink color of the mixture does not wholly disappear within 15 minutes.

Acetyl Chloride, $CH_3.CO.Cl$—A clear, colorless liquid, with a strong pungent odor. It is decomposed by water or alcohol. It is miscible with benzene or chloroform. Specific gravity about 1.1.

Boiling range—Not less than 94 per cent distils between 49° and 53°.

Non-volatile—Evaporate 10 cc. on a steam bath, and dry the residue at 105° for 1 hour: not more than 2.5 mg. of residue remains (approximately 0.02 per cent).

Miscibility with benzene and with chloroform—Separate 5-cc. portions give a clear solution with 20 cc. of benzene or with 20 cc. of chloroform.

Solubility—Place 5 cc. in a 50-cc. graduated cylinder, and cautiously add, dropwise, about 3 cc. of water, shaking after each addition, until the reaction is complete, then dilute with water to 50 cc.: the solution is clear.

Phosphorus compounds—To 10 cc. of the solution obtained in the preceding test add 3 cc. of nitric acid, and evaporate to dryness on a steam bath. Warm the residue with 15 cc. of diluted nitric acid, and nearly neutralize the solution with ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the mixture at about 40° for 5 minutes, and allow to stand for 1 hour. Any yellow precipitate produced is not greater than is formed when 2 cc. of standard phosphate solution, page 731, is treated as in the test (0.02 per cent).

Heavy metals—Dilute 10 cc. of the solution obtained in the test for solubility with 30 cc. of water, add 10 cc. of hydrogen sulfide T.S., and make alkaline with ammonia T.S.: no noticeable change in color is produced.

Acetylcholine Chloride, $[CH_3CO.OCH_2CH_2N(CH_3)_3]Cl$—White, crystalline, odorless or nearly odorless powder. Very deliquescent. Very soluble in water, freely soluble in alcohol.

Melting range—When thoroughly dried at 110° in a capillary tube, it melts between 149° and 152°.

Reaction—A solution (1 in 10) is neutral to litmus paper.

Residue on ignition—The residue from 200 mg. is negligible.

Solubility in alcohol—A solution of 500 mg. in 5 cc. of alcohol is complete and colorless.

Per cent acetyl (CH_3CO)—Weigh accurately about 400 mg. of acetylcholine chloride, previously dried at 105° to 110° for 3 hours, and dissolve it in an Erlenmeyer flask in 15 cc. of water. Add 40 cc. of tenth-normal sodium hydroxide and heat on a steam bath for 30 minutes. Stopper, allow to cool, and titrate the excess of alkali with tenth-normal sulfuric acid, using phenolphthalein T.S. as the indicator. Determine the normality of the tenth-normal sodium hydroxide by titrating 40 cc. after it has been treated in the same manner as in the test. Each cc. of tenth-normal sodium hydroxide is equivalent to 4.304 mg. of CH_3CO. It should show not less than 23.2 per cent and not more than 24.2 per cent of CH_3CO.

Per cent chlorine (Cl)—Weigh accurately about 400 mg. of acetylcholine chloride, previously dried at 105° to 110°, and dissolve it in 50 cc. of water in a 100-cc. volumetric flask. Add with agitation 30 cc. of tenth-normal silver nitrate, then add 5 cc. of nitric acid, and 3 cc. of nitrobenzene, shake well, and titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate

T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 3.546 mg. of Cl. It shows not less than 19.3 and not more than 19.8 per cent of Cl.

Adenine Sulfate, $(C_5H_5N_5)_2.H_2SO_4.2H_2O$—White crystals or crystalline powder. Melts, after drying at 110°, at about 200° with some decomposition. One Gm. dissolves in about 160 cc. of water; less soluble in alcohol. It is soluble in solutions of sodium hydroxide. It is not precipitated from solutions by iodine T.S. or mercuric potassium iodide T.S., but a precipitate is produced with trinitrophenol T.S.

Residue on ignition—Negligible from 100 mg.

Loss on drying—At 110°, not more than 10 per cent.

Agar—Use *Agar*, page 18.

Alcohol, C_2H_5OH—Use *Alcohol*, page 19.

Note: All specific gravities for the following several concentrations of alcohol refer to a temperature of 15.56°.

Alcohol, 90 per cent—Mix 51 cc. of alcohol, page 19, with 3 cc. of water, both measured at 25° The specific gravity of the mixture is 0.827, corresponding to 90 per cent, by volume, of C_2H_5OH

Alcohol, 80 per cent—Mix 45.5 cc. of alcohol, page 19, with 9.5 cc. of water, both measured at 25°. The specific gravity of the mixture is 0.857, corresponding to 80 per cent, by volume, of C_2H_5OH.

Alcohol, 70 per cent—Mix 38.6 cc. of alcohol, page 19, with 15 cc. of water, both measured at 25°. The specific gravity of the mixture is 0.884, corresponding to 70 per cent, by volume, of C_2H_5OH.

Alcohol, Aldehyde-free—Dissolve 2.5 Gm. of lead acetate in 5 cc. of water, add the solution to 1000 cc. of alcohol contained in a glass-stoppered bottle, and mix thoroughly. Dissolve 5 Gm. of potassium hydroxide in 25 cc. of warm alcohol, cool the solution, and add it slowly, without stirring, to the alcohol solution of lead acetate. After 1 hour shake the mixture vigorously, allow it to stand over night, decant the clear liquid, and recover the alcohol by distillation.

Alcohol, Dehydrated (*Absolute Alcohol*), C_2H_5OH—A transparent, colorless, mobile, and volatile liquid, having a characteristic odor, and a burning taste. It is very hygroscopic.

Specific gravity—Not above 0.798, corresponding to not less than 99 per cent C_2H_5OH.

In other respects it complies with the tests prescribed under *Alcohol*, page 19.

Alcohol, Diluted—Use *Diluted Alcohol*, page 20.

Alcohol, Neutralized—To a suitable quantity of alcohol add 2 or 3 drops of phenolphthalein T.S. and just sufficient fiftieth-normal or tenth-normal sodium hydroxide to produce a faint pink color. Neutralized alcohol should be freshly prepared when used.

Alum, Ammonium—Use *Alum*, page 24.

Aluminum, Metallic, Al—In the form of wire, granules, or sheets. Soluble in diluted sulfuric or in hydrochloric acid and in solutions of fixed alkali hydroxides.

Arsenic—Place 750 mg. of aluminum in the generator bottle, page 618, omitting the pledget of cotton. Add 10 cc. of water and 10 cc. of 30 per cent sodium hydroxide solution and allow the reaction to proceed for 30 minutes: not more than a barely perceptible stain is produced on the mercuric bromide test paper.

Aminoacetic Acid, $C_2H_5O_2N$—White crystalline powder. Very soluble in water; slightly in alcohol.

Chloride—Not more than 0.005 per cent, determined turbidimetrically, page 729.

Sulfate—Not more than 0.005 per cent, determined turbidimetrically, page 729.

Heavy metals—Not more than 20 parts per million, page 730.

Residue on ignition—Not more than 0.1 per cent.

***p*-Aminoacetophenone,** C_8H_9NO—Pale yellow crystals or crystalline powder. Characteristic odor. Slightly soluble in cold water, soluble in hot water, and in alcohol; also soluble in diluted hydrochloric acid. Melting range 104° to 106°.

Completeness of solution—A solution of 500 mg. in 10 cc. of alcohol or in 10 cc. of diluted hydrochloric acid is complete and clear

Residue on ignition—The residue from 200 mg. is negligible.

***p*-Aminobenzoic Acid,** $C_7H_7O_2N$—White to slightly yellow crystals or crystalline powder, gradually darkening on exposure to air and light. One Gm. dissolves in about 200 cc. of water; more soluble in hot water and in alcohol; soluble in solutions of alkali hydroxides or carbonates. Melting range 186° to 189°.

Residue on ignition—Not more than 0.1 per cent.

Chloride—The chloride from 200 mg. corresponds to not more than 0.1 mg. of Cl (0.05 per cent), page 729.

Sulfate—The sulfate from 300 mg. corresponds to not more than 1 mg. of SO_4 (0.3 per cent), page 729.

Heavy metals—Not more than 30 parts per million, page 730.

Assay—It may be assayed by titrating with tenth-normal sodium hydroxide with phenolphthalein T.S. as the indicator, using about 300 mg. of a sample dried over sulfuric acid for 4 hours and accurately weighed. It may also be assayed by diazotization with tenth-molar sodium nitrite, using about the same quantity of the sample. Each cc. of tenth-normal sodium hydroxide or of tenth-molar sodium nitrite is equivalent to 13.71 mg. of $C_7H_7O_2N$. Not less than 98.5 per cent should be found.

Ammonia Water, Stronger, Reagent (*Ammonium Hydroxide*)—A solution of ammonia (NH_3), containing not less than 27 per cent by weight of NH_3.

Color—Mix the stronger ammonia water in the original container and pour 10 cc. into a test tube (150 mm. by 20 mm.), and compare with water in a similar tube. The liquids should be equally clear and free from suspended matter, and, viewed across the columns by transmitted light, there should be no apparent difference in color between the two liquids.

Assay—Tare a small, glass-stoppered Erlenmeyer flask containing 15 cc. of water. Quickly add about 2 cc. of the stronger ammonia water, stopper, reweigh, and then

titrate with normal acid, using methyl red T.S. as the indicator Each cc. of normal acid is equivalent to 17.03 mg. of NH_3. It shows not less than 27 per cent of NH_3.

Non-volatile—Evaporate 45 cc. of the stronger ammonia water to dryness, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 2.0 mg. (about 0.005 per cent).

Carbon dioxide—To 10 cc. of the stronger ammonia water add 10 cc. of water (free from carbon dioxide) and 5 cc. of barium hydroxide T.S. The turbidity should not be greater than is produced when the same quantity of barium hydroxide solution is added to 20 cc. of water (free from carbon dioxide), containing 0 5 mg. of anhydrous sodium carbonate (0.002 per cent).

Chloride—To 20 cc. of the stronger ammonia water add 10.0 mg. of anhydrous sodium carbonate and evaporate to dryness. The residue dissolved in 25 cc. of water shows no more chloride than corresponds to 0.01 mg. of Cl (0.00005 per cent), page 729.

Pyridine—Dilute 25 cc. of the stronger ammonia water with 25 cc. of water and nearly neutralize with dilute sulfuric acid (1 in 4), using methyl orange T.S. as the indicator. Stir briskly and note the odor. Not more than a very faint odor of pyridine should be obtained.

Total sulfur (as SO_4)—To 40 cc. of the stronger ammonia water add 20 mg. of anhydrous sodium carbonate and evaporate to a volume of 5 cc. Add 3 drops of bromine T.S. and evaporate to dryness. Add to the residue a slight excess of diluted hydrochloric acid and again evaporate to dryness. This residue, dissolved in 25 cc. of water, shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.0003 per cent) page 729.

Heavy metals—Dilute 10 cc. of the stronger ammonia water to 40 cc. with water and add 10 cc. of hydrogen sulfide T.S.: no brown color should be observed. Any green color should not be greater than is obtained by adding 10 cc. of hydrogen sulfide T.S. to 40 cc. of an ammoniacal solution containing 0.01 mg. of iron (about 2 parts per million heavy metals, about 1 part per million Fe).

Substances reducing permanganate—Dilute 3 cc. of the stronger ammonia water with 5 cc. of water and add 50 cc. of approximately double-normal sulfuric acid. Add 1 drop of tenth-normal potassium permanganate, heat to boiling, and keep at this temperature for 5 minutes: the pink color should not be entirely discharged.

Ammonium Acetate, $NH_4C_2H_3O_2$—Colorless crystals or crystalline masses, usually having a slight acetous odor. Very soluble in water or alcohol. It is very deliquescent. Keep in tight containers.

Assay—Weigh accurately about 1.5 Gm. of ammonium acetate and transfer it completely with the aid of water to a 300-cc. Erlenmeyer flask. Add sufficient water to make about 100 cc., then add exactly 40 cc. of normal sodium hydroxide and boil gently until the vapors no longer turn red litmus paper blue. Cool and titrate the excess of sodium hydroxide with normal sulfuric acid, using phenolphthalein T.S. as the indicator. Determine the normality of the normal sodium hydroxide in the same manner as in the test and make any necessary correction. Each cc. of normal sodium hydroxide is equivalent to 77.08 mg. of $NH_4C_2H_3O_2$. Not less than 97 per cent and not more than 101 per cent of $NH_4C_2H_3O_2$ should be found.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 729.

Residue on ignition—Not more than 0.01 per cent.

Chloride—The chloride from 2 Gm. corresponds to not more than 0.01 mg. of Cl (0.0005 per cent), page 729.

Nitrate—Dissolve 3 Gm. in 8 cc. of water. Add 1 drop of diluted hydrochloric acid, 0.1 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid. The blue color is not completely discharged in 5 minutes (about 0.002 per cent NO_3).

Phosphate—Evaporate 10 Gm. with 15 cc. of nitric acid to dryness on a steam bath. Add to the residue 10 cc. of nitric acid, dilute with 50 cc. of water, and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the mixture at about 40° for 5 minutes, and allow to stand 30 minutes. Any yellow precipitate formed is not more than is produced in a control made in the same manner as the test and with a quantity of potassium biphosphate equivalent to 0.03 mg. of PO_4 (0.0003 per cent PO_4).

Sulfate—Dissolve 5 Gm. in 100 cc. of water, add 1 cc. of diluted hydrochloric acid, heat to boiling, and add 5 cc. of barium chloride T.S. No turbidity or precipitate is produced in 4 hours (about 0.003 per cent SO_4).

Heavy metals—The heavy metals limit for ammonium acetate is 5 parts per million, using 3 Gm. for the test, and acidulating the solution with 3 cc. of normal hydrochloric acid, page 855.

Ammonium Carbonate, $NH_4HCO_3.NH_2.COO.NH_4$—Use *Ammonium Carbonate*, page 37.

Ammonium Chloride, NH_4Cl—Colorless crystals, or a white, granular powder.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 729.

Residue on ignition—To 10 Gm. of the ammonium chloride in an 80-cc. porcelain or silica dish add 2 cc. of reagent sulfuric acid and heat at a temperature which will require at least 1 hour to volatilize the salt. Ignite at low red heat for 5 minutes, cool, and weigh. The weight of the residue should not exceed 1.5 mg. (0.015 per cent).

Neutrality—Dissolve 5 Gm. in 50 cc. of freshly boiled and cooled water and add 1 drop of methyl red T.S. If a red color is produced, not more than 0.10 cc. of tenth-normal alkali should be required to discharge it.

Phosphate—Evaporate 10 Gm. with 15 cc. of nitric acid to dryness on a water bath. Dissolve the residue in 10 cc. of nitric acid, dilute with 50 cc. of water, and nearly neutralize with ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the solution at about 40° for 5 minutes, and allow to stand for 30 minutes. Any precipitate formed should not be greater than is produced when 0.3 cc. of standard phosphate solution, page 731, is treated as in the test (0.0003 per cent PO_4).

Sulfate—Dissolve 2 Gm. in 20 cc. of water, add 1 cc. of normal hydrochloric acid, heat to boiling, add 2 cc. of barium chloride T.S., and allow to stand over night: no turbidity or precipitate is produced.

Calcium and magnesium precipitate—Warm the residue obtained in the determination of the *residue on ignition* with 1 cc. of reagent hydrochloric acid and 3 cc. of water. Add 5 cc. of ammonia T.S., filter, add to the filtrate 2 cc. of ammonium oxalate T.S. and 2 cc. of ammonium phosphate T.S., and allow to stand over night. If any precipitate is formed, filter, and wash the precipitate with a 2.5 per cent solution of

ammonia. The weight of the ignited precipitate should not be more than 1.0 mg. (0.01 per cent).

Heavy metals—The heavy metals limit for ammonium chloride is 5 parts per million, using 3 Gm. for the test, page 730.

Iron—The iron in 3 Gm. corresponds to not more than 0.015 mg. of Fe (0.0005 per cent), page 730.

Ammonium Citrate, Dibasic, $(NH_4)_2HC_6H_5O_7$—Colorless crystals or white granules. Very soluble in water, slightly soluble in alcohol.

Assay for ammonia—Weigh accurately about 1.5 Gm. and dissolve it in 150 cc. of water in a long-necked flask connected by means of a trap with a well-cooled condenser and a receiver, the end of which dips under the surface of exactly 50 cc. of half-normal sulfuric acid. Quickly add to the flask 20 cc. of 10 per cent sodium hydroxide solution, and distil, collecting about 120 cc. of distillate; then titrate the excess acid with half-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of half-normal sulfuric acid is equivalent to 8.515 mg. of NH_3. Not less than 14.7 per cent and not more than 15.5 per cent of NH_3 should be found.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent).

Residue on ignition—The sulfated ash from 2 Gm. is not more than 1.0 mg. (about 0.05 per cent).

Chloride—The chloride from 2 Gm. corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 729.

Phosphate—Dissolve 5 Gm. in 50 cc. of water, add 5 cc. of nitric acid and boil for 5 minutes. Nearly neutralize the solution with ammonia T.S., then add 25 cc. of ammonium molybdate T.S., shake for 5 minutes at about 40°, and allow to stand for 30 minutes. Any precipitate formed is not greater than is produced when 0.5 cc. of standard phosphate solution, page 731, is treated as in the test (0.001 per cent).

Sulfate—Mix 2 Gm. with 500 mg. of anhydrous sodium carbonate and ignite gently until thoroughly charred, protecting from sulfur in the flame. Add to the residue 10 cc. of water and 5 cc. of bromine T.S. and boil gently for 3 minutes, then add 2 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Treat the residue with 10 cc. of hot water, filter, and wash with water to make the filtrate measure 25 cc. Add to the filtrate 0.5 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. If a turbidity is produced, it is not greater than that in a control made as follows: dissolve 500 mg. of anhydrous sodium carbonate in 10 cc. of water, add 5 cc. of bromine T.S., 2 cc. of hydrochloric acid, and follow with a quantity of the standard potassium sulfate solution, page 730, equivalent to 0.2 mg. of SO_4. Evaporate to dryness, then treat the residue in the same manner as in the test (0.01 per cent SO_4).

Heavy metals—Dissolve 3 Gm. in 15 cc. of water, add a drop of phenolphthalein T.S., then add ammonia T.S. until a slight pink color is produced. Add 2 cc. of normal hydrochloric acid, dilute with water to 30 cc., and add 10 cc. of hydrogen sulfide T.S. Any dark color produced is not darker than that in a control containing in 30 cc. of water 0.015 mg. of Pb and 1 cc. of tenth-normal hydrochloric acid (5 parts per million).

Iron—Dissolve 1 Gm. in 15 cc. of water, add 5 drops of nitric acid, boil for 1 min-

ute, and cool. Dilute with water to 25 cc. and add 3 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S. Any red color produced is not darker than in a control made with 0.01 mg. of Fe (10 parts per million).

Ammonium Metavanadate (*Ammonium Vanadate*), NH_4VO_3—A white, crystalline powder. Slightly soluble in cold water; soluble in hot water, and in ammonia.

Solubility in ammonia—Warm 500 mg. with a mixture of 5 cc. of ammonia T.S. and 20 cc. of water: a clear or practically clear and colorless solution results.

Chloride—Dissolve 250 mg. in 40 cc. of hot water, add 2 cc. of nitric acid, allow to stand for 1 hour, and filter. Add to the filtrate 0.5 cc. of silver nitrate T.S. Any turbidity produced corresponds to not more than 0.5 mg. of Cl (0.2 per cent).

Sulfate—Dissolve 500 mg. in 50 cc. of hot water, add 2 cc. of diluted hydrochloric acid and 1.5 Gm. of hydroxylamine hydrochloride, and heat at 60° for 3 minutes. Filter, cool, add to the filtrate 2 cc. of barium chloride T.S., and allow to stand for 15 minutes: no turbidity is produced.

Ammonium Nitrate, NH_4NO_3—Colorless crystals or white granules, very soluble in water, slightly soluble in alcohol.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 729.

Residue on ignition—Heat 10 Gm. gently until the salt is volatilized and ignite for 5 minutes at cherry redness: the residue should not weigh more than 1.0 mg. (0.01 per cent).

Neutrality—Dissolve 5 Gm. in 50 cc. of freshly boiled and cooled water and add 1 drop of methyl red T.S. If a red color is produced, it requires not more than 0.10 cc. of tenth-normal alkali to change it to yellow.

Chloride—The chloride in 2 Gm. corresponds to not more than 0.01 mg. of Cl (0.0005 per cent), page 730.

Nitrite—Dissolve 1 Gm. in 10 cc. of water, add 1 cc. of dilute sulfuric acid (1 volume of sulfuric acid with water to make 10 volumes) and 1 cc. of colorless metaphenylenediamine hydrochloride T.S. No yellowish or brownish color should be produced in 5 minutes (about 0.0005 per cent NO_2).

(NOTE—Metaphenylenediamine hydrochloride solution can be decolorized by treating with a little activated charcoal.)

Phosphate—Dissolve 25 Gm. in 50 cc. of water, add 0.5 cc. of nitric acid and 50 cc. of ammonium molybdate T.S. Shake the solution at about 40° for 5 minutes and allow to stand for 30 minutes. Any precipitate formed is not more than is produced when 1 cc. of standard phosphate solution, page 731, and 5 Gm. of the ammonium nitrate, is treated as in the test (0.0005 per cent PO_4).

Sulfate—Dissolve 5 Gm. in 10 cc. of warm water, add 1 Gm. of anhydrous sodium carbonate, mix well, evaporate and ignite gently until no more volatilizes. Add to the residue 5 cc. of water and 3 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Dissolve the residue in 1 cc. of normal hydrochloric acid and sufficient water to make 25 cc. Filter and add to the filtrate 2 cc. of barium chloride

T.S.: any resulting turbidity is not greater than in a blank to which 0.1 mg. of SO_4 has been added (0.002 per cent).

Heavy metals—The heavy metals limit for ammonium nitrate is 5 parts per million, using 2 Gm. for the test, page 730.

Iron—The iron from 2 Gm. corresponds to not more than 0.004 mg. of Fe (2 parts per million), page 730.

Ammonium Oxalate, $(NH_4)_2C_2O_4.H_2O$—Colorless crystals, soluble in water.

Insoluble—The insoluble matter from 10 Gm., using 200 cc. of hot water for solution, is not more than 1.0 mg. (0.01 per cent), page 729.

Residue on ignition—Ignite 5 Gm. at the lowest possible temperature for volatilization: the residue should not weigh more than 1.0 mg. (0.02 per cent).

Chloride—Dissolve 2 Gm. in 50 cc. of water, add 10 cc. of nitric acid, and 1 cc. of silver nitrate T.S. The turbidity should not be greater than that produced by 0.04 mg. of chloride ion in 50 cc. of water when the same quantities of nitric acid and silver nitrate are added (0.002 per cent Cl).

Sulfate—Dissolve 2 Gm. of ammonium oxalate and about 1 Gm. of anhydrous sodium carbonate in 20 cc. of hot water, evaporate to dryness in a porcelain crucible, and gently ignite the residue with a sulfur-free flame until no more fumes are evolved. Cool, add 10 cc. of water and 1 cc. of bromine T.S., and heat on a water bath for 15 minutes. Add 3 cc. of hydrochloric acid and evaporate to dryness on a water bath: the residue, dissolved in 25 cc. of water, shows no more sulfate than a blank to which 0.12 mg. of SO_4 has been added (0.006 per cent).

Heavy metals—To the residue from the test for *residue on ignition* add 1 cc. of hydrochloric acid and 5 drops of nitric acid, evaporate to dryness on a steam bath, and dissolve the residue in 25 cc. of water. Use 10 cc. of the solution for testing for heavy metals. The heavy metals limit for ammonium oxalate is 10 parts per million, page 730.

Iron—Dilute 10 cc. of the solution from the preceding test to 25 cc. with water, add 2 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S.: any red color produced is not darker than that produced by 0.010 mg. of Fe (5 parts per million).

Ammonium Phosphate, Dibasic (*Diammonium Hydrogen Phosphate*), $(NH_4)_2HPO_4$—White crystals or granules, very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg., page 729.

Reaction to phenolphthalein—A solution of 1 Gm. in 10 cc. of water should be colored pink by the addition of 0.15 cc. of phenolphthalein T.S.

Chloride—The chloride in 2 Gm. corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 729.

Nitrate—Mix 3 Gm. with 2 cc. of water containing 5 mg. of sodium chloride. Add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid, and stir until all of the phosphate is in solution. The blue color should not be completely discharged in 5 minutes (about 0.002 per cent NO_3).

Sulfate—Dissolve 10 Gm. in about 80 cc. of water, add 2 cc. of bromine T.S., heat to boiling, and add 12 cc. of hydrochloric acid. Boil, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is formed, filter and wash until

the washings cease to react with silver nitrate T.S., ignite, and weigh. The weight of the precipitate, after correcting by a complete blank determination on the reagents, including filtration, should not be more than 1.0 mg. (0.004 per cent SO_4).

Alkali salts—Dissolve 3 Gm. in 100 cc. of water and add a solution of 15 Gm. of lead acetate in 50 cc. of water. Filter, measure 100 cc. of the filtrate and precipitate the excess of lead with hydrogen sulfide. Filter without washing, evaporate the filtrate to dryness, ignite gently, and weigh. The weight of the residue should not be more than 2.0 mg. (not more than 0.1 per cent). A correction must be made for possible alkali salts in the lead acetate by evaporating the residue from a solution of 10 Gm. of lead acetate from which the lead has been precipitated with hydrogen sulfide. If a weighable residue is obtained in the blank, it must be further corrected for substances precipitated by ammonium phosphate.

Arsenic—Test 2 Gm. for arsenic as outlined on page 618. The stain produced corresponds to not more than 0.004 mg. of As_2O_3 (2 parts per million).

Heavy metals—Dissolve 5 Gm. in 40 cc. of water, add 40 cc. of normal sulfuric acid and 5 cc. of hydrogen sulfide T.S., and dilute to 100 cc. Any brown color which is immediately developed should not be greater than is produced by 0.05 mg. of lead in the same volume of a solution of a lead salt treated with the same amount of hydrogen sulfide T.S. (10 parts per million).

Iron—Dissolve 1 Gm. in sufficient water to make 40 cc. Dilute 20 cc. of this solution to 40 cc., and add 1 cc. of ammonia T.S. and 5 cc. of freshly prepared hydrogen sulfide T.S. Any color produced is not greater than is produced in a blank containing 0.01 mg. of iron (10 parts per million).

Ammonium Reineckate (*Reinecke Salt*), $NH_4[(Cr(NH_3)_2(SCN)_4].H_2O$—Dark red crystals or red, crystalline powder. Moderately soluble in cold water; more soluble in hot water. It gradually decomposes in solution.

Sensitiveness—Dissolve 50 mg. in 10 cc. of water. Add 0.2 cc. of the solution to 1 cc. of a solution of 10 mg. of choline chloride in 20 cc. of water and shake gently: a distinct precipitate should form within 5 to 10 seconds.

Ammonium Sulfamate, $NH_4OSO_2NH_2$—White, odorless, very hygroscopic crystals or a crystalline powder easily decomposed by heat, and freely soluble in water to form a clear, colorless solution.

Melting range—When previously dried to constant weight in a vacuum over calcium chloride, it melts between 130° and 133°.

Residue on ignition—Not more than 0.1 per cent.

Sulfate—Dissolve 200 mg. in 20 cc. of water, add 5 drops of diluted hydrochloric acid and 1 cc. of barium chloride T.S.: no precipitate or turbidity is produced within ten minutes.

Heavy metals—Not more than 10 parts per million, page 730.

Ammonium Sulfate, $(NH_4)_2SO_4$—Colorless crystals or white granules. Very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 729.

Residue on ignition—To 10 Gm. of the ammonium sulfate in an 80-cc. dish add

1 cc. of sulfuric acid and heat at a temperature that will require at least 1 hour to volatilize the salt. Ignite at low red heat for 5 minutes, cool, and weigh. The weight of the residue should not exceed 1.5 mg. (0.015 per cent).

Neutrality—Dissolve 5 Gm. in 50 cc. of carbon dioxide-free water and add 1 drop of methyl red T.S. If a red color is produced, not more than 0.10 cc. of tenth-normal alkali should be required to change the red color to yellow.

Chloride—The chloride in 2 Gm. corresponds to not more than 0.01 mg. of Cl (0.0005 per cent), page 729.

Nitrate—Dissolve 3 Gm. in 8 cc. of water containing about 10 mg. of sodium chloride. Add 0.1 cc. of indigo carmine T.S. and 10 cc. of reagent sulfuric acid. The blue color is not completely discharged in 5 minutes (about 0.002 per cent NO_3).

Phosphate—Dissolve 5 Gm. in 50 cc. of water, add 10 cc. of nitric acid, nearly neutralize with ammonia T.S., and add 50 cc. of ammonium molybdate T.S. Shake the solution for 5 minutes at about 40° and allow to stand for 1 hour. Any precipitate produced should not be greater than is produced when a quantity of an alkaline phosphate containing 0.025 mg. of PO_4 is treated according to the above procedure (0.0005 per cent PO_4).

Arsenic—Test 1 Gm. by the method outlined on page 618. The stain produced corresponds to not more than 0.005 mg. of As_2O_3 (5 parts per million).

Heavy metals—The heavy metals limit for ammonium sulfate is 5 parts per million, using 3 Gm. for the test, page 730.

Iron—The iron from 3 Gm. corresponds to not more than 0.015 mg. of Fe (5 parts per million), page 730.

Ammonium Thiocyanate, NH_4SCN—Colorless, deliquescent crystals. Very soluble in water, soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Residue on ignition—Ignite 4 Gm. at the lowest possible temperature: the residue should not weigh more than 1.0 mg. (0.025 per cent).

Chloride—To a solution of 4 Gm. of reagent cupric sulfate in 20 cc. of water add 30 cc. of sulfurous acid and 1 Gm. of the thiocyanate dissolved in 10 cc. of water. Boil for about 1 minute, cool quickly, and filter. Add 10 cc. of the sulfurous acid to the filtrate. If additional precipitation takes place, filter and add more sulfurous acid to the filtrate. To the clear filtrate add 5 cc. of nitric acid and 0.5 cc. of silver nitrate T.S. The turbidity should not be greater than is produced in the same volume of water, containing 0.20 mg. of chloride ion, the quantity of sulfurous acid used in the test, enough reagent cupric sulfate to match the color of the test solution, and the quantities of nitric acid and silver nitrate used in the test (0.02 per cent Cl).

Sulfate—The sulfate in 2 Gm. corresponds to not more than 0.1 mg. SO_4 (0.005 per cent), page 729.

Heavy metals—The heavy metals limit for ammonium thiocyanate is 5 parts per million, using 3 Gm. for the test, page 730.

Amyl Alcohol (*Isoamyl Alcohol*), $C_5H_{11}OH$—Colorless, oily liquid. Characteristic, penetrating odor. Specific gravity: about 0.81. Miscible with alcohol, ether, chloroform, carbon disulfide, petroleum benzin, benzene, and with fixed and volatile oils. Slightly soluble in water.

Boiling range—Determine by method II on page 625, using 50 cc. All of it should distil between 128° and 132°.

Non-volatile—Evaporate 40 cc. on a water bath and dry to constant weight at 110°: the weight of the residue should not exceed 1.0 mg. (0.003 per cent).

Acids and esters—Dilute 20 cc. with 20 cc. of alcohol, add 5 cc. of tenth-normal sodium hydroxide, and heat gently under a reflux condenser for 10 minutes. Cool, add 3 drops of phenolphthalein T.S., and titrate the excess of sodium hydroxide with tenth-normal hydrochloric acid. Not more than 0.75 cc. of the tenth-normal sodium hydroxide should have been consumed, correction being made for the amount consumed in a blank test (0.06 per cent, as amyl acetate).

Aldehydes—Shake 5 cc. with 5 cc. of potassium hydroxide solution (30 Gm. in 100 cc.) for 5 minutes in a glass-stoppered cylinder, and allow to separate: no color should develop in either layer.

Substances darkened by sulfuric acid—Cool 10 cc. of the alcohol and 10 cc. of sulfuric acid to 10°, mix, and shake the mixture for 5 minutes: not more than a light brown color appears.

Aniline, $C_6H_5NH_2$—A colorless or pale yellow liquid. Specific gravity: 1.02. Sparingly soluble in water, miscible with alcohol or with ether.

Boiling range—On distilling 100 cc. of aniline by method II described on page 625, not less than 95 cc. distils between 183° and 186°.

Non-volatile—Evaporate 20 cc. and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.005 per cent).

Hydrocarbons and nitrobenzene—Mix 5 cc. with 10 cc. of reagent hydrochloric acid. The solution while still hot from the mixing should be clear and should remain clear after diluting with 15 cc. of cold water.

Aniline Blue, Certified Biological—A water-soluble dye consisting of a mixture of the tri-sulfonates of tri-phenyl pararosaniline and of diphenylrosaniline.

Aniline Sulfate, $(C_6H_5NH_2)_2.H_2SO_4$—White, or nearly white crystals or crystalline powder: very soluble in water, slightly soluble in alcohol, insoluble in ether.

Insoluble—A solution of 1 Gm. in 50 cc. of water is colorless and clear, or nearly so.

Residue on ignition—Cautiously ignite 2 Gm. to constant weight: the weight of the residue is not more than 2.0 mg. (0.1 per cent).

Chloride—Dissolve 250 mg. in a mixture of 18 cc. of water and 2 cc. of nitric acid, and add 1 cc. of silver nitrate T.S.: no turbidity is produced in 15 seconds.

Heavy metals—The heavy metals limit for aniline sulfate is 20 parts per million, using 1 Gm. for the test, page 730.

Arsenic Trioxide, As_2O_3—A white powder or irregular masses.

Non-volatile—Ignite 5 Gm. in a platinum dish under a hood to constant weight: the weight of the residue should not exceed 1.0 mg. (0.02 per cent).

Insoluble in ammonia water—Heat 5 Gm. with 50 cc. of ammonia water (1 in 3) in an Erlenmeyer flask connected with a reflux condenser until the arsenic is dissolved. Filter through asbestos in a Gooch crucible, wash with warm dilute ammonia T.S.,

and dry at 110° to constant weight. The weight of the insoluble residue does not exceed 0.5 mg. (0.01 per cent).

Chloride—Dissolve 1 Gm. in 10 cc. of warm dilute ammonia water (1 in 3), cool, and add an excess of diluted nitric acid and 2 cc. of silver nitrate T.S. The turbidity, if any, is not greater than that produced by 0.05 mg. of chloride in an equal volume of solution containing the same quantities of the same reagents used in the test (0.005 per cent of Cl).

Sulfide—Dissolve 1 Gm. in 10 cc. of sodium hydroxide T.S. and add 1 drop of lead acetate T.S. The color should be the same as that of an equal volume of the sodium hydroxide solution to which only the lead acetate is added (about 0.001 per cent of S).

Antimony and other hydrogen sulfide metals—Dissolve 1 Gm. in 10 cc. of reagent hydrochloric acid and 10 cc. of water, and evaporate to dryness. Dissolve the residue in 2 cc. of reagent hydrochloric acid and 2 cc. of water, and evaporate again. Dissolve the residue in 1 cc. of hydrochloric acid, dilute to 10 cc. with water, neutralize with ammonia T.S., and add 1 cc. of normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no color is produced (about 20 parts per million of Sb or about 10 parts per million of Pb).

Iron—To the residue obtained in the test for *Non-volatile* add 2 cc. of hydrochloric acid and 0.5 cc. of nitric acid, and evaporate to dryness on a steam bath. Dissolve the residue in 1 cc. of hydrochloric acid, and add sufficient water to make 50 cc. To 20 cc. of the solution add 2 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S. Any red color produced is not darker than that of a control made with 0.01 mg. of iron (5 parts per million).

Asbestos—The silky, well-matted variety of long fiber, amphibole asbestos. Digest with diluted hydrochloric acid for 24 hours and wash with water until free of acid. Then digest for 24 hours with sodium hydroxide T.S. Wash until free of alkali, digest for 3 hours with diluted nitric acid, and finally wash with water until free of acid and shake with water to a fine pulp.

Ascorbic Acid, $C_6H_8O_6$—Use *Ascorbic Acid*, page 52.

Azolitmin—A water-soluble coloring matter obtained from litmus; in dark, violet scales; soluble with difficulty in water, more easily soluble in hot water; insoluble in alcohol or dilute acid; very soluble in dilute alkalies, forming deep blue solutions

Dissolve 1 Gm. of azolitmin in 80 cc. of hot water and add 20 cc. of alcohol to the solution. Add 0.1 cc. of this solution to 50 cc. of water (free from carbon dioxide). The bluish red color of the liquid is changed to red by the addition of 0.05 cc. of tenth-normal hydrochloric acid; or it is changed to bluish violet by the addition of 0.05 cc. of tenth-normal sodium hydroxide.

Baker's Yeast, Fresh—The moist, living cells of *Saccharomyces cerevisiæ* Meyen or of other species of *Saccharomyces* (Fam. *Saccharomycetaceæ*) free of starch or other absorbent base. The yeast cells may be identified under the microscope.

Barium Chloride, $BaCl_2.2H_2O$—Colorless crystals, readily soluble in water, slightly soluble in alcohol and in hydrochloric acid.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Nitrate and chlorate—Dissolve 2 Gm. in 20 cc. of water, add 1 cc. of sulfuric acid to precipitate the barium, and filter. Superimpose 10 cc. of the filtrate upon 10 cc. of diphenylamine solution (500 mg. in 100 cc. of sulfuric acid and 20 cc. of water). No blue ring should develop between the two solutions within 20 minutes (about 0.005 per cent as NO_3).

Calcium and alkali salts—Dissolve 5 Gm. in 150 cc. of water, add 1 cc. of hydrochloric acid and heat to boiling. Add 25 cc. of dilute sulfuric acid (1 volume of reagent acid and water to make 15 volumes), cool, make up to 250 cc. with water, and allow to stand over night. Decant through a filter, evaporate 100 cc. of the filtrate to dryness and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.05 per cent as sulfate).

Strontium and calcium chlorides—Add 20 cc. of dehydrated alcohol to 2 Gm. of the finely powdered barium chloride. Allow to stand for 30 minutes with occasional shaking. Filter, to 10 cc. of the filtrate, add a few drops of sulfuric acid, evaporate, and ignite gently to constant weight: the weight of the residue should not exceed 1.0 mg. (0.10 per cent).

Heavy metals—The heavy metals limit for barium chloride is 5 parts per million, using 2 Gm. for the test, page 730.

Iron—The iron in 2 Gm. corresponds to not more than 0.006 mg. of Fe (3 parts per million), page 730.

Barium Chloride, Anhydrous—This may be made by drying barium chloride in thin layers at 125° until the loss in weight between two successive, 3-hour drying periods does not exceed 1 per cent.

Barium Hydroxide, $Ba(OH)_2 . 8H_2O$—Colorless crystals, soluble in water.

Assay and carbonate—Weigh accurately about 5 Gm. of clear crystals and dissolve in about 200 cc. of carbon dioxide-free water. Titrate with normal hydrochloric acid, using phenolphthalein T.S. as the indicator, until the pink color is destroyed. Each cc. of normal acid is equivalent to 157.8 mg. of $Ba(OH)_2 . 8H_2O$. The volume of the acid consumed corresponds to not less than 97 per cent of $Ba(OH)_2 . 8H_2O$. Continue the titration with methyl orange T.S. until the solution is colored slightly pink. Each cc. of normal acid is equivalent to 98.69 mg. of $BaCO_3$. The additional volume of acid corresponds to not more than 3 per cent of barium carbonate.

Insoluble in hydrochloric acid—Dissolve 10 Gm. in 100 cc. of water and 10 cc. of reagent hydrochloric acid. Heat on a water bath for 1 hour, filter through asbestos in a Gooch crucible, wash thoroughly, and dry to constant weight at from 105° to 110°. The weight of the residue should not exceed 1.0 mg. (0.01 per cent).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.02 mg. of Cl (0.002 per cent), page 729.

Sulfide—Dissolve 1 Gm. in 8 cc. of warm water, add 5 drops of alkaline lead solution (made by adding sodium hydroxide to lead acetate T.S. until the precipitate is redissolved), then add 2 cc. of glacial acetic acid: no darkening should be produced (about 0.001 per cent S).

Calcium and alkali salts—Dissolve 5 Gm. in 150 cc. of hot water and 5 cc. of reagent hydrochloric acid. Heat to boiling and add 25 cc. of dilute sulfuric acid (1 volume of reagent acid and water to make 15 volumes). Allow to cool, make up to 250 cc. with water, and allow to stand over night. Decant 100 cc. through a filter. evapo-

rate to dryness, and ignite to constant weight: the weight of the residue is not more than 4.0 mg. (0.20 per cent as sulfate).

Heavy metals—Mix 2 Gm. with 20 cc. of water and cautiously add hydrochloric acid until no more dissolves and the solution is slightly acid to litmus. Evaporate to dryness in glass or porcelain on a steam bath. Test the residue for heavy metals as described in the test for *Heavy metals in reagents*, page 730. The heavy metals limit for barium hydroxide is 10 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 730.

Barium Nitrate, $Ba(NO_3)_2$—Colorless crystals, soluble in water, practically insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm., dissolved in 150 cc. of hot water, weighs not more than 1.0 mg. (0.01 per cent), page 729.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.005 mg. of Cl (0.0005 per cent), page 729.

Calcium and alkali salts—Determine the calcium and alkali salts as directed under *barium chloride*, page 744. The weight of the residue does not exceed 1.0 mg. (0.05 per cent as sulfate).

Calcium and strontium salts—Dissolve 2 Gm. in 15 cc. of hot water, add 10 cc. of hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 10 cc. of hot water, add 10 cc. of hydrochloric acid, evaporate to dryness again, and dry in an oven at 105°. Grind the residue to a fine powder, and treat with 20 cc. of dehydrated alcohol. Allow to stand for 30 minutes with occasional shaking, and filter. To 10 cc. of the filtrate add a few drops of sulfuric acid, and ignite gently to constant weight. The weight of the residue does not exceed 1 mg. (0.10 per cent as sulfate).

Heavy metals—The heavy metals limit for barium nitrate is 5 parts per million, using 2 Gm. for the test, page 730.

Iron—The iron in 2 Gm. corresponds to not more than 0.006 mg. of Fe (3 parts per million), page 730.

Beef Extract—Use *Beef Extract*, N. F. VIII.

Benzene, C_6H_6—A colorless, transparent, inflammable liquid, having a characteristic, agreeable aromatic odor. Specific gravity about 0.876. Insoluble in water; miscible with alcohol and with ether.

Boiling range—Determine by method II as described on page 625. Not less than 95 cc. distils between 79.5° and 81°.

Congealing temperature—When tested according to the method described on page 629, the temperature of congelation should not be below 5.2°.

Non-volatile—Evaporate 115 cc. on a water bath and dry at from 105° to 110° for 30 minutes. The weight of the residue does not exceed 1.0 mg. (about 0.001 per cent).

Water—Place 10 cc. in a test tube (150 × 16 mm.) loosely stoppered, and immerse it in ice. No turbidity should be observed at the end of 3 minutes (about 0.02 per cent).

Sulfur compounds—Place 30 cc. of alcoholic potassium hydroxide T.S. in an Erlenmeyer flask, add 6 cc. of the benzene, and boil the mixture gently for 30 minutes under a reflux condenser. Detach the condenser, dilute with 50 cc. of water, and

heat on a water bath until the benzene and alcohol are evaporated. Add 50 cc. of bromine T.S. and heat for 15 minutes longer. Transfer the solution to a beaker, neutralize with dilute hydrochloric acid (1 in 5), add an excess of 1 cc. of the acid, and concentrate to about 50 cc. Filter if necessary, heat the filtrate to boiling and add 5 cc. of barium chloride T.S., heat on a water bath for 2 hours, and allow to stand over night. If a precipitate is formed, filter through a small filter paper, wash with water until the washings no longer react with silver nitrate T.S., and ignite. The weight of the barium sulfate is not more than 2.0 mg. after correcting for a blank on the same quantities of the same reagents used in the test, including filtration and ignition, even if no precipitate is visible (about 0.005 per cent as S).

Substances darkened by sulfuric acid—Shake 25 cc. with 15 cc. of reagent sulfuric acid for from 15 to 20 seconds and allow to separate. Neither the benzene nor the acid is darkened.

Thiophene—Add a few milligrams of isatin to the mixture of benzene and sulfuric acid from the preceding test, shake well, and allow to stand for 1 hour: the acid layer should not acquire a blue or green color.

Benzidine (*Paradiaminodiphenyl*), $(C_6H_4NH_2)_2$—A white or slightly reddish, crystalline powder. Very slightly soluble in water, in alcohol and in ether.

Melting range—It melts between 127° and 129°.

Residue on ignition—Cautiously ignite 2 Gm. to constant weight: the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Solution in dilute hydrochloric acid—Add 1 Gm. to a mixture of 50 cc. of water and 5 cc. of reagent hydrochloric acid: complete or nearly complete solution results.

Sulfate—To the filtered solution obtained in the preceding test add 1 cc. of barium chloride T.S.: no turbidity or precipitate should appear within 30 minutes.

Benzin, Petroleum—Use *Petroleum Benzin*, page 397.

Benzoic Acid, —Use *Benzoic Acid*, page 70.

Benzoyl Chloride, $C_6H_5.COCl$—A clear, colorless, fuming liquid with a pungent odor. It is decomposed by water or alcohol; soluble in benzene or ether. Specific gravity about 1.20.

Assay—Weigh accurately about 2 cc. in a dry, glass-stoppered flask. Add 50 cc. of normal sodium hydroxide, stopper, and allow to stand with frequent agitation until all the benzoyl chloride has dissolved. Then titrate the excess of sodium hydroxide with normal acid, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 70.25 mg. of C_6H_5COCl. Not less than 98 per cent is found.

Boiling range—Distil 50 cc. by method II, page 625: not less than 47 cc. distils between 194° and 198°.

Non-volatile—Evaporate 5 cc. in a porcelain crucible and ignite gently to constant weight: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Phosphorus compounds—Boil 4 cc. with a mixture of 5 cc. of water and 10 cc. of nitric acid for 2 minutes, then add 40 cc. of water, filter, and wash with water until the filtrate and washings measure 50 cc. Nearly neutralize 30 cc. of the filtrate with stronger ammonia T.S., add 30 cc. of ammonium molybdate T.S., shake for 5 minutes at 40°, and allow to stand for 30 minutes. Any yellow precipitate formed is not

more than that in a blank to which has been added a quantity of reagent potassium biphosphate equivalent to 0.20 mg. of PO_4 (about 0.002 per cent P).

Betanaphthol, $C_{10}H_7OH$—Use *Betanaphthol,* page 76.

Biotin, $C_{10}H_{16}N_2O_3S$ (2-Keto-3,4-imidazolido-2-tetrahydrothiophene-*n*-valeric acid)—A white, crystalline powder. Biotin is destroyed by strong oxidizing agents such as hydrogen peroxide or peroxide-containing ether.

Solubility—Very slightly soluble in water but readily soluble in dilute solutions of alkali hydroxides. Practically insoluble in cold alcohol or in the usual organic solvents.

Melting range—Between 230° and 232°, with some decomposition.

Specific rotation—$[\alpha]_D^{22} = +92°$ determined in a 0.3 per cent solution in tenth-normal sodium hydroxide.

Blood (for carbon monoxide test in gases)—For this purpose use *oxalated* or *defibrinated blood* of dogs, sheep, cattle, or human beings within 24 hours after bleeding. Prepare *oxalated blood* by adding 10 mg. of neutral potassium oxalate to each cc. of blood, immediately when drawn.

Boric Acid, H_3BO_3—It conforms to the tests and assay given for *Boric Acid,* page 82, and in addition it also meets the following tests:

Chloride—The chloride in 1 Gm. corresponds to not more than 0.02 mg. of Cl, page 729.

Phosphate—Dissolve 5 Gm. in 75 cc. of warm water, and add 10 cc. of nitric acid and 8 cc. of stronger ammonia T.S. Warm the solution to 60°, if necessary, add 50 cc. of ammonium molybdate T.S., and shake for 5 minutes. Any precipitate formed is not greater than is produced when 0.5 cc. of standard phosphate solution, page 731, is treated as in the test (0.0005 per cent).

Sulfate—Dissolve 4 Gm. in 75 cc. of hot water, and add 1 cc. of hydrochloric acid. Heat the solution to boiling, add 5 cc. of barium chloride T.S. and let stand overnight. If a precipitate is formed, filter, wash, ignite, and weigh. The weight of the precipitate is not more than 1.0 mg. greater than the weight of the ignited precipitate from a blank (0.01 per cent SO_4).

Calcium—The addition of 5 cc. of ammonium oxalate T.S. to a solution of 2 Gm. of boric acid in 25 cc. of water and 1 cc. of glacial acetic acid produces no turbidity within 10 minutes.

Non-volatile with methanol—Dissolve 2 Gm. of the powdered sample in 25 cc. of methanol in a platinum dish, add 5 cc. of hydrochloric acid, and evaporate to dryness. Add 15 cc. of methanol and 3 drops of hydrochloric acid, and repeat the evaporation to dryness. Then add 3 drops of sulfuric acid to the residue, and ignite: the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Bromine, Br—A dark reddish brown, fuming, corrosive liquid. Sparingly soluble in water, soluble in alcohol or in ether with gradual decomposition of the solvents.

Chlorine—Shake 6 volumes of the bromine with 1 volume of water. The specific gravity of the bromine saturated with water is not less than 3.099, corresponding to not more than about 0.3 per cent of chlorine.

Non-volatile matter—Volatilize 5 cc. in a weighed porcelain dish on a steam bath: the weight of the residue should not exceed 2.5 mg. (0.015 per cent).

Organic bromine compounds—Add 1 cc. of bromine to 25 cc. of 10 per cent sodium hydroxide solution, dilute with an equal volume of water, and allow to stand over night: no oily drops or film should separate.

Iodine—Shake 1 cc. with 50 cc. of water and about 3 Gm. of granulated zinc until all of the bromine is reduced. Filter, add to the filtrate 1 cc. of ferric chloride T.S. and 5 cc. of chloroform, and shake it well. No pink or violet color should appear (about 0.05 per cent I).

Sulfur compounds—Weigh about 5 cc. of the bromine, add 1 cc. of nitric acid, allow to stand for 30 minutes, and evaporate to dryness on a water bath. Add a few drops of hydrochloric acid and evaporate again to dryness. The residue dissolved in 25 cc. of hot water shows no more sulfate than corresponds to 0.006 per cent of SO_4 (0.002 per cent of S), page 729.

Butyl Alcohol, Normal (*n-Butanol*), $CH_3(CH_2)_2CH_2OH$—A clear, colorless liquid having a characteristic odor; miscible with dehydrated alcohol and with ether.

Specific gravity—About 0.81.

Boiling range—When distilled by method II, as directed on page 625, not less than 95 per cent of it should distil between 115° and 118°.

Solution in alcohol or ether—Mix 5 cc. with 25 cc. of dehydrated alcohol: a clear solution results. When mixed with 5 times its volume of ether, the solution is also clear.

Non-volatile—Evaporate 10 cc. on a water bath and dry at 100° for 30 minutes: not more than 1.5 mg. of residue remains (0.02 per cent).

Free acid—Mix 10 cc. with 25 cc. of neutral dehydrated alcohol, add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide: not more than 0.2 cc. of the tenth-normal sodium hydroxide is required to produce a pink color (0.02 per cent, as butyric acid).

Calcium Biphosphate (*Calcium Phosphate Monobasic*), $Ca(H_2PO_4)_2.H_2O$—White, somewhat deliquescent crystals, or crystalline powder. Sparingly soluble in water; insoluble in alcohol.

Insoluble in hydrochloric acid—Heat 10 Gm. with a mixture of 90 cc. of water and 10 cc. of hydrochloric acid until dissolved. Filter any undissolved residue, wash it well with water, and dry at 105°. Its weight does not exceed 2.0 mg. (0.02 per cent).

Dibasic salt or excess acid—Triturate 1 Gm. with 3 cc. of water, then dilute with 100 cc. of water, and add 1 drop of methyl orange T.S. A red color is produced (*absence of dibasic salt*), which is changed to yellow by not more than 1 cc. of normal sodium hydroxide (*excess acid*).

Chloride—Dissolve 1 Gm. in 30 cc. of water and 2 cc. of nitric acid, filter if necessary, and add 1 cc. of silver nitrate T.S. Any resulting turbidity corresponds to not more than 0.05 mg. of Cl (0.005 per cent).

Nitrate—Mix 500 mg. with 5 cc. of water and add just sufficient hydrochloric acid to dissolve. Dilute with water to 10 cc., add 0.1 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid. The blue color persists for 1 minute (about 0.07 per cent NO_3).

Sulfate—Heat 5 Gm. with a mixture of 5 cc. of hydrochloric acid and 100 cc. of water until dissolved, and filter. Heat the filtrate to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. Filter any precipitate if present, wash it with hot water, and ignite. The weight of the precipitate does not exceed 10 mg. (about 0.08 per cent SO_4).

Ammonia—To 1 Gm. add 10 cc. of hot water and just sufficient hydrochloric acid to dissolve, then dilute with water to 30 cc., and add 20 cc. of 10 per cent sodium hydroxide solution. Filter, and to 25 cc. of the filtrate add 1 cc. of Nessler's reagent. The resulting color is not darker than that of a control made with 0.05 mg. of NH_3, and 10 cc. of the sodium hydroxide solution in the same final volume as the sample (0.01 per cent).

Arsenic—Test 200 mg. for arsenic as described on page 618. The stain produced corresponds to not more than 0.002 mg. of As_2O_3 (10 parts per million).

Barium—Heat 1 Gm. with 10 cc. of water and add hydrochloric acid dropwise, stirring after each addition until just dissolved. Filter and add to the filtrate 5 cc. of calcium sulfate T.S. No turbidity is produced in 1 hour.

Heavy metals—Heat 2 Gm. with 20 cc. of water and add hydrochloric acid dropwise, stirring after each addition until dissolved. Dilute with water to 40 cc., and to 20 cc. of the dilution add 5 cc. of hydrogen sulfide T.S. The solution is not darkened.

Calcium Carbonate, $CaCO_3$—Use *Precipitated Calcium Carbonate*, page 92.

Calcium Chloride, $CaCl_2.2H_2O$—White, small crystals; very soluble in water, soluble in alcohol.

Assay—Weigh accurately about 1 Gm., and dissolve it in sufficient water to make exactly 100 cc. Transfer 20 cc. to a glass-stoppered flask, add 30 cc. of water, and slowly run in, while agitating, 50 cc. of tenth-normal silver nitrate. Add 3 cc. of nitric acid and 3 cc. of nitrobenzene, shake vigorously, then titrate the excess of silver nitrate with tenth-normal ammonium thiocyanate, using ferric ammonium sulfate T.S. as the indicator. Each cc. of tenth-normal silver nitrate is equivalent to 5.55 mg. of $CaCl_2$. Not less than 74 per cent and not more than 78 per cent of $CaCl_2$ should be found.

Insoluble and ammonium hydroxide precipitate—Dissolve 10 Gm. in 100 cc. of water and heat to boiling. Render slightly alkaline with ammonia T.S. (free from carbonate) and boil for 5 minutes. If a precipitate is formed, filter through a small paper and wash with a little hot water. Reserve the filtrate for the test for sulfate. Redissolve the precipitate with hot dilute hydrochloric acid (1 in 3), boil the solution (which should amount to about 20 cc.) for 1 or 2 minutes, and make slightly alkaline with ammonia T.S. Filter through the same paper as before, wash thoroughly and ignite to constant weight: the weight of the ignited residue should not exceed 1.5 mg. (0.015 per cent).

Acidity—Dissolve 2 Gm. in 20 cc. of water free from carbon dioxide and add 2 drops of phenolphthalein T.S. A pink color should be produced on the addition of 1 drop of tenth-normal sodium hydroxide solution.

Alkalinity—Dissolve 5 Gm. in 50 cc. of water free from carbon dioxide and add 2 drops of phenolphthalein T.S. If any pink color is produced, it should be discharged by not more than 0.3 cc. of tenth-normal hydrochloric acid (0.02 per cent as $Ca(OH)_2$).

Nitrate—Dissolve 2 Gm. in 10 cc. of water, add 0.1 cc. of indigo carmine T.S., and add, with stirring, 10 cc. of sulfuric acid. The blue color should not be entirely discharged in 10 minutes (about 0.003 per cent NO_3).

Sulfate—Neutralize the filtrate from the test for *insoluble and ammonium hydroxide precipitate* with reagent hydrochloric acid, and add an excess of 1 cc. of the acid. Heat to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is formed, proceed as described for sulfate under *Ammonium Phosphate, Dibasic*, page 740, beginning with "filter." The weight of the barium sulfate is not greater than 2.5 mg. (0.01 per cent SO_4).

Ammonia—Dissolve 2 Gm. in 45 cc. of water, and add 15 cc. of 10 per cent sodium hydroxide solution. Filter, and to 30 cc. of the filtrate add 2 cc. of Nessler's reagent. Any color developed is not more intense than that in a blank test made with 0.05 mg. of NH_3 (0.005 per cent).

Barium—Dissolve 2 Gm. in 15 cc. of water, add 2 Gm. of sodium acetate and 1 drop of glacial acetic acid, filter if necessary, and add 3 cc. of potassium dichromate T.S. At the end of 15 minutes the solution should show no turbidity when compared in a 50-cc. Nessler tube with a similar tube containing only water and dichromate solution in the same quantities as in the test (about 0.005 per cent Ba).

Magnesium and alkali salts—To 2 Gm. of the calcium chloride in 100 cc. of water add 5 cc. of hydrochloric acid, heat to boiling and add 100 cc. of a 4 per cent oxalic acid solution. Slowly neutralize with ammonia T.S. over a period of about 30 minutes while the solution is cooling. Dilute with water to 250 cc., allow to stand for 4 hours, and filter. To 125 cc. of the filtrate add 10 drops of sulfuric acid, evaporate to dryness, and ignite gently to constant weight. The weight of the residue does not exceed 5.0 mg. (0.5 per cent as sulfate).

Heavy metals—The heavy metals limit for calcium chloride is 10 parts per million, using 2 Gm. for the test, page 730.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 730.

Calcium Chloride, Anhydrous, $CaCl_2$—Deliquescent lumps or porous masses.

Assay—Assay by the method given under *Calcium Chloride*, page 750. It shows not less than 94 per cent of $CaCl_2$.

Magnesium and alkali salt—Determine by the method given under the preceding reagent. The residue does not exceed 2 per cent.

Calcium Hydroxide—Use *Calcium Hydroxide*, page 96.

Calcium Oxide (*Lime*), CaO—Hard, white or grayish white masses or granules, or a white powder; odorless.

Assay—Ignite about 1 Gm. of lime to constant weight over a blast lamp, weigh accurately, add 50 cc. of water and follow cautiously with 20 cc. of diluted hydrochloric acid. Cool the solution, dilute with water to exactly 100 cc., and mix well. Transfer 20 cc. of this solution to a 200-cc. volumetric flask, add 100 cc. of tenth-normal oxalic acid, make alkaline with ammonia T.S., shake the mixture well, and allow it to stand for 3 hours at from 60° to 70°, or over night at room temperature. Cool if necessary, make up to the mark with water, mix well, filter through a filter, which has not been previously moistened, into a dry flask and reject the first 20 cc. of filtrate. Acidify 100 cc. of the filtrate with diluted sulfuric acid, then add 25 cc. more of the diluted sulfuric acid, warm the solution to about 80°, and titrate the excess of

oxalic acid with tenth-normal potassium permanganate to a faint pink color. Each cc. of tenth-normal oxalic acid is equivalent to 2.804 mg. of CaO. It shows not less than 95 per cent of CaO.

Insoluble—Slake 5 Gm. of lime with 100 cc. of water. Add hydrochloric acid, drop by drop, with agitation, until all of the lime is dissolved, then add 1 cc. more of the acid. Boil, filter, wash thoroughly with hot water, and dry at 105°. The weight of the insoluble residue does not exceed 50.0 mg. (1 per cent).

Carbonate—Slake 1 Gm. of lime, thoroughly mix with 50 cc. of water, allow to settle, and decant the milky liquid: the addition of an excess of diluted hydrochloric acid to the residue causes not more than a slight effervescence.

Loss on ignition—Transfer about 1 Gm. of lime, accurately weighed, to a tared platinum crucible and ignite to constant weight with a blast lamp. The loss in weight does not exceed 10 per cent.

Magnesium and alkalies—Mix 1.0 Gm. of the lime with 75 cc. of water, add hydrochloric acid, drop by drop, until all of the lime is dissolved, and then add 1 cc. of the acid in excess. Boil the solution for a few minutes, neutralize with ammonia T.S., and add sufficient hot ammonium oxalate T.S. to precipitate all of the calcium. Allow to stand on a water bath for 2 hours, cool, dilute with water to 150 cc., mix well, and filter. To 50 cc. of the filtrate add 10 drops of sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue does not exceed 20 mg. (about 2 per cent as MgO).

Keep in tight containers.

Calcium Oxide, Freshly Slaked, $Ca(OH)_2$—To prepare freshly slaked lime, add slowly to a convenient quantity of reagent lime one-third of its weight of water, cover, and allow to stand until it has been converted into a pulverulent mass and is cool.

Calcium Pantothenate, $(C_9H_{16}NO_5)_2Ca$—White, odorless powder. Moderately hygroscopic; reasonably stable in air and on exposure to light; freely soluble in water, soluble in glycerin, slightly soluble in alcohol or acetone. Its solution (1 in 20) is neutral or slightly alkaline to litmus.

Specific rotation, $[\alpha]^{25}_{D}$, determined in a solution containing in each 100 cc. the equivalent of 5 Gm. of anhydrous calcium pantothenate and using a 200-mm. tube, is between +25° and +27°, page 675.

Loss on drying—When about 500 mg., accurately weighed, is dried in a vacuum desiccator over sulfuric acid for 24 hours, the loss in weight does not exceed 5 per cent.

Chloride—The chloride from 200 mg. corresponds to not more than 0.1 mg. of Cl (0.05 per cent), page 729.

Sulfate—The sulfate from 200 mg. corresponds to not more than 0.1 mg. of SO_4 (0.05 per cent), page 729.

Heavy metals—The heavy metals limit is 30 parts per million, using 1 Gm. for the test and acidulating with 1 cc. of normal hydrochloric acid, page 855.

Per cent calcium—The calcium content determined on about 500 mg. of the dried sample by the method described under *Calcium Gluconate*, page 94, is not less than 8.2 per cent and not more than 8.6 per cent.

Calcium Sulfate, $CaSO_4 . 2H_2O$—White powder or pulverulent masses. Soluble in about 400 parts of water, less soluble in hot water, insoluble in alcohol.

Insoluble in hydrochloric acid—Dissolve with the aid of heat 1 Gm. of calcium sulfate in a mixture of 50 cc. of water and 10 cc. of reagent hydrochloric acid. If an insoluble residue remains, filter, wash until free of sulfate, and ignite to constant weight: the weight of the residue does not exceed 1.0 mg. (0.1 per cent).

Chloride—Agitate 500 mg. of calcium sulfate for 5 minutes with a mixture of 20 cc. of water and 5 cc. of nitric acid and filter. The filtrate, without further acidulation, shows no more chloride than corresponds to 0.075 mg. of Cl (0.015 per cent), page 729.

Magnesium and alkali salts—To the filtrate obtained in the test for *Insoluble in hydrochloric acid*, add an excess of ammonium oxalate T.S., heat to boiling, and add sufficient ammonia T.S. to render the solution distinctly alkaline. Dilute the solution, after cooling, to 150 cc., mix well, allow to stand over night, and filter. Evaporate 75 cc. of the filtrate to dryness and ignite to constant weight: the weight of the residue should not exceed 3.0 mg. (0.6 per cent).

Heavy metals—Boil 1 Gm. of the salt for 5 minutes with a mixture of 20 cc. of water and 2 cc. of hydrochloric acid. Cool, neutralize with ammonia T.S., add 1 cc. of normal hydrochloric acid, filter if necessary, and add to the filtrate 10 cc. of hydrogen sulfide T.S.: no darkening is produced.

Canada Turpentine—A liquid oleoresin from *Abies balsamea* (Linné) Miller (Fam. *Pinaceæ*). A pale yellow or greenish, transparent liquid. Very soluble in ether, in chloroform, and in benzene.

When exposed to air, it slowly dries and remains transparent.

Canada turpentine solidifies when mixed with 20 per cent of its weight of magnesium oxide, previously moistened with water.

Carbon Disulfide, CS_2—A clear, colorless, volatile, and inflammable liquid. It is odorless when fresh, but on standing in contact with air it acquires a yellow color and a disagreeable odor. This change is accelerated by exposure to light. It is very slightly soluble in water, very soluble in alcohol, in chloroform, and in ether.

Specific gravity—About 1.26.

Boiling range—Distil 100 cc. by method II given on page 625: not less than 95 cc. should distil between 46° and 47°.

Non-volatile—Evaporate 40 cc. at from 50° to 60°: the residue should not have a disagreeable odor. Dry for 1 hour at 60° and weigh. The weight of the residue should not exceed 1.0 mg. (0.002 per cent).

Water—Cool 10 cc. in a test tube to 0°: no turbidity or drops of water appear.

Foreign sulfides and dissolved sulfur—Shake 2 cc. in a dry test tube with a globule of mercury for 2 minutes: the mercury may discolor slightly but retains a bright luster.

Sulfite and sulfate—Shake 10 cc. with 10 cc. of water in a separator for 5 minutes; separate and discard the carbon disulfide. To the water layer add 1 drop of tenth-normal iodine. A yellow or violet color should be produced. Add to the solution 1 cc. of barium chloride T.S.: no turbidity should be produced in 15 minutes (about 0.002 per cent as SO_2).

Keep in tight, light-resistant containers at a temperature preferably not above 25°.

Carbon Tetrachloride, CCl_4—A clear, colorless liquid.

Specific gravity—1.588 to 1.590.

Boiling range—Distil 100 cc. by method II, page 625: not less than 95 per cent distils between 76° and 78°.

Non-volatile—Evaporate 60 cc. on a water bath and dry at 105° to 110° for 30 minutes: the weight of the residue does not exceed 1.0 mg. (0.001 per cent).

Acid—Shake 15 cc. with 25 cc. of water (carbon dioxide free) for 5 minutes, separate and reject the carbon tetrachloride. Add to 10 cc. of the water layer 2 drops of phenolphthalein T.S. and 0.05 cc. of tenth-normal sodium hydroxide: a pink color is produced.

Aldehyde—Shake 10 cc. with 10 cc. of water containing 0.05 cc. of tenth-normal potassium permanganate: the color does not disappear in 5 minutes.

Chloride ion—To 10 cc. of the water layer obtained in the test for *acid* add 2 drops of nitric acid and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than is produced by 0.02 mg. of chloride ion in 10 cc. of water in the same quantities of acid and silver nitrate used in the test (0.0002 per cent).

Free chlorine—Shake 10 cc. for 2 minutes with 10 cc. of water to which 2 drops of potassium iodide T.S. have been added, and allow to separate: the lower layer does not show a violet tint.

Iodine-consuming substances—To 25 cc. add 1 drop of tenth-normal iodine and shake well: the violet color remains at the end of 30 minutes.

Sulfur compounds—Determine as described under *Benzene*, page 746, using 3 cc. of carbon tetrachloride. The weight of the barium sulfate is not greater than 2.0 mg. (0.005 per cent as S).

Substances darkened by sulfuric acid—Shake 20 cc. with 5 cc. of sulfuric acid for 5 minutes in a glass-stoppered cylinder which has been rinsed with the sulfuric acid. After the layers have separated, the sulfuric acid shows not more than a slight yellow color.

Casein—A white or slightly yellow, odorless, granular powder. Insoluble in water and other neutral solvents, but readily dissolved by ammonia T.S. and by solutions of alkali hydroxides, usually forming a cloudy solution.

Residue on ignition—Ignite 2 Gm., slowly at first, to constant weight: the residue does not exceed 20.0 mg. (1 per cent).

Loss on drying—Dry 2 Gm. at 100° to constant weight: the loss in weight does not exceed 200 mg. (10 per cent).

Alkalinity—Shake 1 Gm. of casein with 20 cc. of water for 10 minutes and filter: the filtrate is not alkaline to red litmus paper.

Soluble substances—When the filtrate from the *alkalinity* test is evaporated and dried at 100°, the residue does not exceed 1.0 mg. (0.10 per cent).

Fats—Dissolve 1 Gm. of casein in 10 cc. of water and 5 cc. of alcoholic ammonia T.S., and shake out with two successive portions of 20 cc. each of petroleum benzin. Evaporate the benzin at a low temperature and dry at 70°: the residue should not exceed 5.0 mg. (0.50 per cent).

Nitrogen—When determined by the *Kjeldahl* method, page 671, from 15.2 to 16 per cent of nitrogen should be found on the anhydrous basis.

Catechol (*o-Dihydroxybenzene*), $C_6H_4(OH)_2$—White crystals which become discolored on exposure to air and light, readily soluble in water, alcohol, benzene, ether, chloroform, or in pyridine, forming clear solutions.

Melting range—From 104° to 105°.

Residue on ignition—Ignite 500 mg. with 5 drops of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.20 per cent).

Cedar Oil (for clearing microscope sections). A selected, distilled oil from the wood of the red cedar, *Juniperus virginiana* Linné (Fam. *Pinaceæ*) should be used for this purpose. Refractive index: about 1.504 at 20°. For use with homogeneous immersion lenses, a specially prepared oil having a refractive index of exactly 1.515 at 18° is required.

Ceric Sulfate, $Ce(SO_4)_2$ with a variable amount of water. It also contains sulfates of the other associated earths. Yellow to orange yellow crystals or crystalline powder. Almost insoluble in cold water; slowly soluble in cold dilute mineral acids, more readily soluble when heated with these solvents.

Assay—Weigh accurately about 800 mg. of the ceric sulfate, transfer to a flask, add 25 cc. of water and 3 cc. of sulfuric acid, and warm until dissolved. Cool, add 60 cc. of a mixture of 1 volume of phosphoric acid and 20 volumes of water. Add 25 cc. of 10 per cent potassium iodide solution, stopper the flask, and allow to stand for 15 minutes; then titrate the liberated iodine with tenth-normal sodium thiosulfate in an atmosphere of carbon dioxide, using starch as an indicator toward the end. One cc. of tenth-normal sodium thiosulfate is equivalent to 33.23 mg. of $Ce(SO_4)_2$. The assay should show not less than 80 per cent of $Ce(SO_4)_2$.

Chloride—Dissolve 1 Gm. of ceric sulfate in a mixture of 5 cc. of nitric acid and 45 cc. of water. Filter if not clear, and divide into two equal portions. To one portion add 1 cc. of silver nitrate T.S., allow to stand for 10 minutes, filter until clear, and use for the control. To the other portion add 1 cc. of silver nitrate T.S.: the resulting turbidity in the second portion is not greater than that produced by adding 0.05 mg. of Cl to the control (0.01 per cent).

Heavy metals—Heat 500 mg. with a mixture of 10 cc. of water and 0.5 cc. of sulfuric acid until dissolved. Cool, dilute with water to 50 cc., and saturate with hydrogen sulfide: a precipitate of sulfur forms which is white or not darker than pale yellow.

Iron—Dissolve 100 mg. of ceric sulfate in a mixture of 5 cc. of water and 2 cc. of hydrochloric acid, warming if necessary, and cool. Dilute with water to 25 cc. in a stoppered cylinder, add 5 cc. of ammonium thiocyanate T.S. and 25 cc. of ether. Shake gently, but well, and allow to separate. The pink color in the ether layer is not darker than that produced by diluting a quantity of standard iron solution containing 0.20 mg. of Fe with 2 cc. of hydrochloric acid and sufficient water to measure 25 cc., then treating this solution with ammonium thiocyanate and ether in the same manner as the ceric sulfate solution.

Charcoal—Use *Activated Charcoal*, page 119.

Chloral Hydrate—Use *Chloral Hydrate*, page 122.

Chloranil (*Tetrachlorobenzoquinone*), $C_6Cl_4O_2$—Golden yellow leaflets. Insoluble in water, slightly soluble in alcohol, soluble in ether. It dissolves in sodium hydroxide solutions forming a violet red solution.

Melting range—When determined in a sealed tube in a bath preheated to 270°, it melts at about 295°.

Residue on ignition—(sulfated)—Not more than 0.2 per cent.

Chlorinated Lime—White or grayish white powder, having the odor of chlorine. It rapidly decomposes on exposure to air. Partially soluble in water and in alcohol.

Assay—Transfer to a mortar about 4 Gm. of chlorinated lime, accurately weighed in a tared weighing bottle, using 50 cc. of water. Triturate thoroughly, and pour the mixture into a 1000-cc. graduated flask, rinsing the mortar with water to make 1000 cc. Stopper the flask, and allow it to stand for 10 minutes. Shake thoroughly, add to 100 cc. of the mixture 1 Gm. of potassium iodide and 5 cc. of acetic acid, and titrate the liberated iodine with tenth-normal sodium thiosulfate, starch T.S. being used as the indicator. Each cc. of tenth-normal sodium thiosulfate is equivalent to 3.546 mg. of available chlorine (Cl). Not less than 30 per cent is found.

Preserve in tight containers in a cool, dry place.

Chloroform, $CHCl_3$—Use *Chloroform*, page 126.

Cholesterol—Use *Cholesterol*, page 128.

Choline Chloride, $(CH_3)_3N.CH_2.CH_2OHCl$—White crystals or crystalline powder. Very soluble in water and freely soluble in alcohol. It is hygroscopic and usually has a slight amine-like odor. Its solution is neutral to litmus paper.

Residue on ignition—Not more than 0.1 per cent.

Ammonium compounds—To 5 cc. of a solution (1 in 20) add 300 mg. of anhydrous sodium carbonate and warm to about 60°: the vapors do not turn red litmus paper blue.

Heavy metals—The heavy metals limit for choline chloride is 50 parts per million, using 500 mg. for the test and acidulating with 0.5 cc. of normal hydrochloric acid.

Assay—Dry about 300 mg. of choline chloride in a small, tared weighing bottle at 110° for 4 hours, and weigh accurately. Then proceed as described in the assay under *Ammonium Chloride*, page 737, beginning with "dissolve in about 40 cc. of water . . . ." Each cc. of tenth-normal silver nitrate is equivalent to 3.546 mg. of Cl. Not less than 25 per cent and not more than 25.8 per cent of Cl is found.

Chromium Trioxide, CrO_3—Use *Chromium Trioxide*, page 129.

Chromotropic Acid (*1,8-Dihydroxynaphthalene-3,6-disulfonic Acid*), $C_{10}H_8O_8S_2.2H_2O$—White to brownish powder; soluble in water. It is usually available as its sodium salt, $C_{10}H_6O_8S_2Na_2$, which is yellow to light brown in color, and freely soluble in water. The addition of some sodium hydroxide to 5 cc. of the solution (1 in 500) produces a violet red color. The addition of 1 drop of ferric chloride T.S. to a solution of 1 mg. in 10 cc. of water produces a grass green color.

Sensitiveness—Dilute exactly 0.5 cc. of formaldehyde T.S. with water to make 1000 cc. Dissolve 5 mg. of chromotropic acid, or its sodium salt, in 10 cc. of a mixture of 9 cc. of sulfuric acid and 4 cc. of water. Add 5 cc. of this solution to 0.2 cc. of the formaldehyde dilution and heat for 10 minutes at 60°: a violet color is produced.

Citric Acid—Use *Citric Acid*, page 134.

Cobaltous Acetate (*Cobalt Acetate*), $Co(C_2H_3O_2)_2.4H_2O$—Red, needle-like crystals, soluble in water or in alcohol.

Insoluble—Use 5 Gm. and dissolve it in 100 cc. of water containing 2 cc. of glacial

acetic acid: the insoluble residue weighs not more than 1.0 mg. (0.02 per cent), page 729.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.1 mg. of Cl (0.01 per cent), page 729.

Nitrate—Dissolve 500 mg. in 10 cc. of water and add, with stirring, 10 cc. of sodium hydroxide T.S. and heat on a water bath for 30 minutes. Cool, dilute to 20 cc., mix well, and filter. To 10 cc. of the filtrate add 5 mg. of sodium chloride, 2 drops of indigo carmine T.S., and 10 cc. of sulfuric acid. The blue color should not entirely disappear in 1 minute (about 0.05 per cent NO_3).

Sulfate—Heat the filtrate from the *insoluble* matter, exclusive of the washings, to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is present, proceed as described under the determination of sulfur compounds in *Ammonium Phosphate, Dibasic*, page 740. The weight of the barium sulfate is not greater than 2.5 mg. (0.02 per cent SO_4).

Alkali and alkaline earths—Dissolve 2 Gm. in about 90 cc. of water, add 2 Gm. of ammonium chloride, and sufficient ammonia T.S. to redissolve the precipitate first formed. Pass hydrogen sulfide into this solution until the cobalt is completely precipitated. Add sufficient water to make the total volume 100 cc., mix well, and filter. Evaporate 50 cc. of the filtrate nearly to dryness, add 0.5 cc. of sulfuric acid, and ignite to constant weight. The weight of the residue should not exceed 3.0 mg. (0.3 per cent).

Copper—Solution A—Dissolve 500 mg. in 30 cc. of water and add 1 cc. of reagent hydrochloric acid. Solution B—Dissolve another 500 mg. in 20 cc. of water, add 1 cc. of reagent hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no change in color should be noticeable when compared with solution A.

Nickel—Dissolve 1 Gm. in 200 cc. of water, add 1 Gm. of sodium citrate, heat to boiling, add 100 cc. of 1 per cent alcohol solution of dimethylglyoxime, follow with 15 cc. of ammonia T.S., and allow to stand over night. Filter through asbestos in a weighed Gooch crucible, wash with water, then with 50 per cent alcohol, and dry to constant weight at 105°: the weight of the precipitate does not exceed 25.0 mg. (0.5 per cent Ni).

Cobaltous Chloride (*Cobalt Chloride*), $CoCl_2.6H_2O$—Red crystals or a red, crystalline powder. Very soluble in water and in alcohol; soluble in acetone and in glycerin.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Nitrate—Dissolve 1 Gm. of cobalt chloride in 10 cc. of water, add, with stirring, 10 cc. of 10 per cent sodium hydroxide solution and heat on a water bath for 30 minutes. Cool, dilute to 20 cc., mix well, and filter. To 10 cc. of the filtrate add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid. The blue color should not entirely disappear in 5 minutes (about 0.01 per cent NO_3).

Sulfate—Determine the sulfate in the filtrate from the test for insoluble matter, exclusive of the washings, as described under *Cobaltous Acetate*, page 756. The weight of the barium sulfate does not exceed 5 mg. (0.02 per cent SO_4).

Alkali and alkaline earths—Determine as described under *Cobaltous Acetate*, page 756: the weight of the residue should not exceed 3.0 mg. (0.3 per cent as sulfates).

Copper—Solution A—Dissolve 1 Gm. of the cobalt chloride in 30 cc. of water and add 0.5 cc. of reagent hydrochloric acid. Solution B—Dissolve 1 Gm. of cobalt

chloride in 20 cc. of water, add 0.5 cc. of reagent hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no change in color should be noticeable when compared with solution A.

Iron—Dissolve 1 Gm. in 20 cc. of water, boil with 1 cc. of nitric acid, then add 1 Gm. of ammonium chloride and sufficient ammonia T.S. to dissolve the precipitate first formed. Filter and wash thoroughly. Drop on the filter 5 cc. of hot dilute hydrochloric acid (1 in 2) and wash with hot water until the filtrate and washings measure about 45 cc. Cool and add 3 cc. of ammonium thiocyanate T.S., dilute to 50 cc., and mix thoroughly. Any red color should not be greater than that in a control test made with the same volume of water and hydrochloric acid to which has been added 0.05 mg. of ferric iron (50 parts per million).

Nickel—Determine the nickel as described under *Cobaltous Acetate*, page 756: the weight of the precipitate is not greater than 10.0 mg. (0.2 per cent).

Congo Red (*Sodium diphenyl-diazo-bis-alphanaphthylamine-4-sulfonate*), $(C_6H_4N{:}NC_{10}H_5NH_2SO_3Na)_2$—A brownish red powder, slightly soluble in cold water or in alcohol; soluble in hot water, forming a deep red solution. pH range: 3.0—blue; 5.0—red.

Sensitiveness—Dissolve 100 mg. in 18 cc. of water and 2 cc. of alcohol and add 3 drops of this solution to 100 cc. of carbon dioxide-free water. The red color is changed to violet by 0.1 cc. of tenth-normal hydrochloric acid and is restored on the subsequent addition of 0.1 cc. of tenth-normal sodium hydroxide.

Copper, Cu—Copper in the form of wire, foil, turnings, filings, or granules. Insoluble in hydrochloric acid; soluble in nitric acid or in hot sulfuric acid.

Antimony and tin—Dissolve 5 Gm. of copper in a mixture of 20 cc. of nitric acid and 10 cc. of water and evaporate to dryness on a water bath. Dissolve the residue in about 50 cc. of diluted nitric acid: no insoluble residue remains.

Lead—To 10 cc. of the nitric acid solution obtained in the test for *Antimony and tin* add 2 cc. of sulfuric acid and evaporate to dense white fumes of sulfur trioxide, then cautiously dilute with water to about 20 cc.: no insoluble residue remains.

Silver—To a second 10-cc. portion of the above nitric acid solution add 1 cc. of diluted hydrochloric acid: no turbidity is produced.

Cotton, Non-absorbent—The hairs of the seed of cultivated varieties of *Gossypium herbaceum* Linné, or of other species of *Gossypium* (Fam. *Malvaceæ*), freed from adhering impurities and linters, and sterilized.

Cupric Acetate, $Cu(C_2H_3O_2)_2.H_2O$—Bluish green crystals or powder having an acetous odor. Soluble in water, slightly soluble in alcohol.

Insoluble—Use 10 Gm. and dissolve it in 100 cc. of water containing 2 cc. of glacial acetic acid; the weight of the insoluble residue is not greater than 1.0 mg. (0.01 per cent), page 729.

Chloride—The chloride from 1 Gm. corresponds to not more than 0.03 mg. of Cl (0.003 per cent), page 729.

Sulfate—To the filtrate from the test for insoluble matter add 5 cc. of glacial acetic acid. Heat to boiling, add 5 cc. of barium chloride T.S., and proceed as directed under *Ammonium Phosphate, Dibasic*, page 740. The weight of the barium sulfate obtained is not more than 2.5 mg. (0.01 per cent SO_4).

Substances not precipitated by hydrogen sulfide—Dissolve 5 Gm. in about 200 cc.

of water, add 2 cc. of sulfuric acid, heat to about 70°, and pass in hydrogen sulfide gas until the copper is completely precipitated. Dilute with water to 250 cc. and filter without washing. Evaporate 200 cc. of the filtrate to dryness, ignite, and weigh the residue: the weight of the residue should not exceed 8 mg. (0.2 per cent).

Iron—Warm the residue obtained from the preceding test with 1 cc. of reagent hydrochloric acid and 2 drops of nitric acid, and dilute to 20 cc. with water. Dilute 5 cc. of this solution with 25 cc. of water and add 2 cc. of reagent hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color is not greater than is produced in a blank with 0.1 mg. of Fe (100 parts per million).

Metals, other than iron, precipitated by ammonium sulfide—To 10 cc. of the above solution of the residue add a slight excess of ammonia T.S., boil for 1 minute, filter, and wash with a small quantity of hot water. Dilute the filtrate and washings to 25 cc. Exactly neutralize 5 cc. of the filtrate and washings with diluted hydrochloric acid and dilute to 20 cc. Add 2 drops of ammonia T.S. and 1 cc. of hydrogen sulfide T.S. The solution should not be darker than a standard solution prepared in the same way and containing 0.04 mg. of Ni (100 parts per million).

Cupric Sulfate, $CuSO_4.5H_2O$—Deep blue, triclinic crystals or a blue powder.

Insoluble—Dissolve 10 Gm. in 100 cc. of water containing 3 cc. of sulfuric acid: the insoluble residue weighs not more than 1.0 mg. (0.01 per cent).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.01 mg. of Cl (0.001 per cent), page 729.

Substances not precipitated by hydrogen sulfide—Determine as described under *Cupric Acetate,* see above: the residue weighs not more than 4.0 mg. (0.1 per cent).

Ammonium hydroxide precipitate—Treat the residue from the preceding test with 2 cc. of hydrochloric acid and a few drops of nitric acid, and evaporate almost to dryness. Dissolve in a mixture of 10 drops of hydrochloric acid and 10 cc. of water, filter if necessary, and wash the filter paper with a few cc. of water. Add to the filtrate a slight excess of ammonia T.S. and heat for 2 minutes. If a precipitate is formed, filter through a small filter paper, wash with small quantities of water, ignite, and weigh: the ignited residue should not weigh more than 0.4 mg. (about 0.01 per cent).

Metals, other than iron, precipitated by ammonium sulfide—Dilute the filtrate and washings obtained in the previous test to 100 cc. with water. Exactly neutralize 10 cc. with diluted hydrochloric acid and dilute to 20 cc. Add 0.1 cc. of ammonia T.S. and 1 cc. of hydrogen sulfide T.S. The solution should not be darker than a standard prepared in the same way and containing 0.04 mg. of Ni (100 parts per million).

Cupric Sulfate, Anhydrous, $CuSO_4$—A white or grayish white powder free from a blue tinge. Upon the addition of a small quantity of water, it becomes blue. It is soluble in water.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.02 mg. of Cl (0.002 per cent), page 729.

Substances not precipitated by hydrogen sulfide—Proceed as described under *Cupric Acetate,* page 758. The residue should not weigh more than 6 mg. (0.15 per cent). Keep in well-stoppered bottles.

Curare—The composition of curare is not definitely known. Different specimens vary, depending upon the species of plant or plants used in their manufacture.

The most important source of curare is the bark of several varieties of *Strychnos*, the species most commonly employed being *S. Castelnæi* Wedd., *S. toxifera* Benth., or *S. Crevauxii* G. Planch. (Fam. *Loganiaceæ*) and *Chondodendron tomentosum* Ruiz et Pavon (Fam. *Menispermaceæ*). Commercial curare is a brownish or black, shiny, resinoid mass. Soluble in cold water, very soluble in diluted alcohol.

l-Cystine, HOOC.(NH_2)CH.CH_2.S—S.CH_2.CH(NH_2).COOH—White, crystalline powder, very slightly soluble in water, insoluble in alcohol or other organic solvents; soluble in dilute mineral acids and in solutions of alkali hydroxides.

Specific rotation, $[\alpha]_D^{30}$, determined in a solution of hydrochloric acid (made by mixing 75 cc. of normal hydrochloric acid and 25 cc. of water) containing the equivalent of 4 Gm. of cystine in each 100 cc. and using a 200-mm. tube, is between $-200°$ and $-203°$.

Residue on ignition—Not more than 0.05 per cent.

Devarda's Alloy (*Devarda's Metal*)—A gray powder composed of 50 parts of copper, 45 parts of aluminum, and 5 parts of zinc.

Dextrin, $(C_6H_{10}O_5)n.xH_2O$—A white, amorphous powder. Slowly soluble in cold water; more readily soluble in hot water; insoluble in alcohol.

Insoluble—Boil 1 Gm. with 30 cc. of water in a small flask: the solution is colorless and clear, or not more than opalescent.

Loss on drying—When about 1 Gm., accurately weighed, is dried at 105° to constant weight, the loss corresponds to not more than 10 per cent.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid: the weight of the residue does not exceed 5 mg. (0.5 per cent).

Chloride—Dissolve 3 Gm. in 75 cc. of boiling water, cool, dilute to 75 cc., and filter, if necessary. To 25 cc. of the filtrate add 2 cc. of nitric acid and 1 cc. of silver nitrate T.S., and allow to stand for 5 minutes. Any turbidity produced is not greater than that of a blank to which 0.02 mg. of Cl has been added (0.002 per cent).

Sulfate—To a 25-cc. portion of the filtrate from the preceding test add 0.5 cc. of diluted hydrochloric acid and 2 cc. of barium chloride T.S., and allow to stand for 10 minutes. Any turbidity produced is not greater than that of a blank to which 0.2 mg. of SO_4 has been added (0.02 per cent).

Alcohol-soluble substances—Boil 1 Gm. with 20 cc. of alcohol for 5 minutes under a reflux condenser, and filter while hot. Evaporate 10 cc. of the filtrate on a steam bath, and dry at 105°: the weight of the residue does not exceed 5 mg. (1 per cent).

Reducing sugars—Shake 2 Gm. with 100 cc. of water for 10 minutes, and filter until clear. To 50 cc. of the filtrate add 50 cc. of Fehling's solution, and boil for 3 minutes. Filter through a tared crucible, wash with water, then with alcohol, and finally with ether, and dry at 105° for 2 hours. The weight of the precipitate of cuprous oxide is not more than 115 mg. (corresponding to about 5 per cent of reducing sugars as dextrose).

Dextrose, $C_6H_{12}O_6.H_2O$—Use *Dextrose*, page 161.

Dextrose, Anhydrous, $C_6H_{12}O_6$—It meets the requirements for *Dextrose*, page 161, except that the test for *Loss on drying* should read: "When dried to constant weight at 100°, Anhydrous Dextrose loses not more than 1 per cent of its weight."

2,6-Dichlorophenol-indophenol Sodium (*2,6-Dichlorobenzenone-indophenol Sodium*), O:$C_6H_2Cl_2$:N.C_6H_4ONa with about $2H_2O$. A dark green powder. Soluble

in water, also in alcohol, but insoluble in ether and in chloroform. The solution is deep blue, changing to red on the addition of acid.

Loss on drying—When dried at 120° to constant weight, the loss corresponds to not more than 12 per cent.

Interfering dyes—Solution A—Dissolve 50 mg. of 2,6-dichlorophenol-indophenol sodium and 42 mg. of sodium bicarbonate in sufficient water to make 200 cc., and filter the solution through a small, dry filter, rejecting the first 20 cc. of the filtrate.

Solution B—Dissolve 50 mg. of ascorbic acid in 50 cc. of a solution composed of 3 Gm. of metaphosphoric acid, 8 cc. of glacial acetic acid, and sufficient water to make 100 cc.

To 15 cc. of Solution A add 2.5 cc. of Solution B. The resulting mixture should be colorless.

Diiodofluorescein, $C_{20}H_{10}I_2O_5$—Orange red, odorless powder. Slightly soluble in water, soluble in alcohol and in solutions of alkali hydroxides.

Residue on ignition—Ignite 200 mg. with 5 drops of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.5 per cent).

Sensitiveness—Weigh accurately about 100 mg. of potassium iodide, previously dried at 100° to constant weight, and dissolve it in 50 cc. of water. Add 1 cc. of diiodofluorescein T.S. made from the sample being tested and 1 cc. of glacial acetic acid, and titrate with tenth-normal silver nitrate until the color of the precipitate changes from brownish red to a bluish red. The volume of tenth-normal silver nitrate consumed should not be in excess of 0.1 cc. over the calculated volume, based on the KI content of the dried potassium iodide as determined under *Potassium Iodide*, page 427.

p-Dimethylaminobenzaldehyde, $(CH_3)_2N.C_6H_4CHO$—White or pale yellow crystals or crystalline powder. Slightly soluble in water; soluble in alcohol, ether, and in dilute hydrochloric acid.

Melting range—From 73° to 75°.

Residue on ignition—Not more than 0.1 per cent.

Solubility in alcohol—One Gm. dissolves completely in 25 cc. of alcohol.

Solubility in hydrochloric acid—A solution of 1 Gm. in 20 cc. of diluted hydrochloric acid is clear and colorless or only slightly yellow.

Dimethylglyoxime, $(CH_3)_2C_2(NOH)_2$—White, needle-shaped crystals, or a crystalline powder; almost insoluble in water, soluble in alcohol. It melts at about 240°.

Insoluble in alcohol—Heat 2 Gm. under a reflux condenser with 100 cc. of alcohol until no more dissolves. Filter, wash with hot alcohol, dry at 105°: the weight of the insoluble residue does not exceed 1.0 mg. (0.05 per cent).

Residue on ignition—Ignite 2 Gm. of dimethylglyoxime with 0.5 cc. of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

2,4-Dinitrochlorobenzene, $C_6H_3(NO_2)_2Cl$—Yellow to brownish yellow crystals. Insoluble in water, soluble in hot alcohol, in ether, and in benzene. It melts between 51° and 53°.

Residue on ignition—Ignite 500 mg. with 5 drops of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.2 per cent).

2,4-Dinitrophenylhydrazine, $[2,4\text{-}C_6H_3(NO_2)_2NH.NH_2]$—Orange red crystals,

which under the microscope appear individually to be lemon yellow, lath-like needles; very slightly soluble in water, slightly soluble in alcohol, moderately soluble in dilute inorganic acids. When heated in a capillary tube, the edges of the crystals soften at about 190°, the mass sinters at about 194°, and melts between 198° and 200°.

Solubility in sulfuric acid—Dissolve 500 mg. of dinitrophenylhydrazine in a mixture of 25 cc. of sulfuric acid and 25 cc. of water: the solution is clear or not more than slightly turbid.

Residue on ignition—The residue on ignition from 500 mg. is negligible.

Melting range of the hydrazone—The dinitrophenylhydrazone obtained by the interaction of dinitrophenylhydrazine and an alcohol solution of natural camphor melts between 166° and 168°.

Dioxane (*Diethylene Dioxide*), $C_4H_8O_2$—Clear, colorless liquid having an ethereal odor. Sp. gr. about 1.031. Miscible with water and the usual organic solvents.

Boiling range—Dioxane distils between 101° and 103°.

Congealing range—It congeals between 9° and 11°.

Non-volatile—Evaporate 10 cc. on a steam bath and dry the residue for 2 hours at 110°. The weight of the residue does not exceed 1 mg.

Diphenylamine, $(C_6H_5)_2NH$—White crystals, possessing a slight, aromatic odor. It melts between 52.5° and 53.5°. Slightly soluble in water; soluble in alcohol.

Nitrate—Dissolve 200 mg. of diphenylamine in 20 cc. of sulfuric acid and 2 cc. of water: the solution remains colorless.

Residue on ignition—Ignite 2 Gm. with 1 cc. of sulfuric acid. The weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Dithizone (*Diphenylthiocarbazone*), $C_6H_5.NH.NH.CS.N{:}N.C_6H_5$—A bluish black or nearly black powder; insoluble in water; soluble in alcohol, in chloroform, and in carbon tetrachloride, yielding intensely green solutions even in high dilutions.

Residue on ignition—Ignite 1 Gm., cool, add 1 cc. of nitric acid and 1 cc. of sulfuric acid, and ignite gently to constant weight. The residue weighs not more than 3 mg.

Heavy metals—Digest the residue obtained in the test for *Residue on ignition* with 10 cc. of ammonium acetate T.S. in a covered crucible on a steam bath for 30 minutes. Filter, and wash with 10 cc. of water. To the combined filtrate and washings add 2 cc. of normal hydrochloric acid, dilute with water to make 25 cc., and add 10 cc. of hydrogen sulfide T.S. If a darkening is produced, it is not greater than that of a control made with 0.02 mg. of Pb (20 parts per million).

Sensitiveness—Prepare a chloroform solution of dithizone in the proportion of 10 mg. of the dithizone in 1000 cc. of chloroform. To 5 cc. of this solution add 0.10 cc. of *standard lead solution*, page 657, follow with 5 cc. of ammonia-cyanide solution, page 834, and shake well. The color of the chloroform layer is distinctly pink by comparison with a blank made with 5 cc. of the same dithizone solution treated in the same manner, but omitting the addition of the lead solution.

Eosin Y, Certified Biological (Eosin Yellowish Y)—*Sodium tetrabromofluorescein*, $C_{20}H_6Br_4O_5Na_2$. Red to brownish red pieces or powder. One Gm. dissolves in about 2 cc. of water or in 50 cc. of alcohol.

Color characteristics—A 1:500 solution is yellowish to purplish red with a greenish fluorescence. A 1:12,000 alcohol solution is pink to purplish red with a greenish yellow fluorescence. The addition of mineral acids to a solution (1 in 100) produces an orange to reddish orange precipitate of tetrabromofluorescein. On adding 2 cc. of saturated sodium hydroxide solution to 10 cc. of a solution of the dye (1 in 100), a red precipitate is formed.

Assay—Weigh accurately about 500 mg. and dissolve in 300 cc. of water. Heat the solution to boiling, add 3 cc. of normal hydrochloric acid, and cool to about 25°. Collect the precipitate on a tared Gooch crucible with asbestos pad, previously dried at 110°. Wash the precipitate with small portions of cold water until the washings cease to react with silver nitrate T.S., and dry at 110° to constant weight. The weight of the dried precipitate, multiplied by 1.068, represents the quantity of the dye in the weight of the sample taken for the assay, and it corresponds to not less than 85 per cent.

Epinephrine, $C_6H_3(OH)_2CHOHCH_2NHCH_3$—Use *Epinephrine*, page 196.

Ether—Use *Ether*, page 209, or *Ethyl Oxide*, page 212.

Ether, Absolute, $C_2H_5OC_2H_5$—It conforms to the description, test for non-volatile matter, acid, and for aldehyde under *Ether*, page 209, and in addition it must comply with the following tests:

Specific gravity—Not over 0.710.

Non-volatile—Allow 100 cc. to evaporate from a tared shallow dish and dry at 100° for 1 hour. The weight of the residue does not exceed 1.0 mg. (0.0015 per cent).

Peroxide—To 10 cc. of the ether, contained in a small, clean, glass-stoppered cylinder, previously rinsed with a portion of the ether under examination, add 1 cc. of a freshly prepared 10 per cent solution of potassium iodide. Shake the mixture and allow it to stand for 1 minute: no yellow color should be observable in either layer (limit of peroxide as H_2O_2, about 0.001 per cent). NOTE—Fresh ether should meet this test, but after storage for several months peroxide may be formed.

Substances darkened by sulfuric acid—Cool 10 cc. of sulfuric acid to about 10°, and add, drop by drop, with gentle stirring, 10 cc. of the ether. The resulting mixture should not have more than a faint color.

Ethyl Acetate, $CH_3COOC_2H_5$—A transparent, colorless, inflammable liquid. Soluble in water, miscible with alcohol, ether, and with fixed and volatile oils. Specific gravity: 0.893 to 0.898.

Boiling range—Distil 100 cc. by method II, page 625: not less than 95 per cent distils between 76° and 77.5°.

Non-volatile—Allow 20 cc. to evaporate in a dish and dry for 1 hour at from 105° to 110°: the weight of the residue should not exceed 1.0 mg. (0.005 per cent).

Acid—Ethyl acetate does not redden moistened blue litmus paper.

Foreign esters—Evaporate 5 cc. from clean, odorless, unsized paper: the final odor is not different in character from that observed at the beginning of the test.

Readily carbonizable substances—Superimpose 5 cc. of ethyl acetate upon 5 cc. of sulfuric acid: no dark coloration is produced at the zone of contact.

Ethyl Cyanoacetate, $CN.CH_2.COOC_2H_5$—Colorless to pale yellow liquid; pleasant odor. Slightly soluble in water; miscible with alcohol and with ether. At

atmospheric pressure it boils between 205° and 209° with decomposition. At 10 mm. pressure it distils at about 90°.

Specific gravity—1.057 to 1.062.

Free acid—Dissolve 2 cc. in 25 cc. of neutralized alcohol, add 2 drops of phenolphthalein T.S., and titrate with tenth-normal sodium hydroxide to the production of a pink color. Not more than 1.5 cc. of the sodium hydroxide solution is required.

Ferric Ammonium Sulfate, $FeNH_4(SO_4)_2.12H_2O$—Pale violet crystals, efflorescent on exposure to air. Very soluble in water; insoluble in alcohol.

Insoluble—Use 10 Gm. and dissolve in 100 cc. of water containing 1 cc. of hydrochloric acid: the weight of the insoluble residue does not exceed 1.0 mg. (0.01 per cent), page 729.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.01 mg. of Cl (0.001 per cent), page 729.

Substances not precipitated by ammonia—Dissolve 5 Gm. in 70 cc. of water, heat to boiling and pour into a mixture of 40 cc. of water and 10 cc. of stronger ammonia T.S. Filter through a folded filter while hot and wash with hot water until the filtrate measures 150 cc. Evaporate 60 cc. of the filtrate to dryness and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.05 per cent).

Ferrous iron—Dissolve 1 Gm. in a mixture of 20 cc. of water and 1 cc. of reagent hydrochloric acid and add 1 drop of freshly prepared potassium ferricyanide T.S. No blue or green color should be produced in 1 minute (about 0.001 per cent ferrous Fe).

Zinc and copper—Neutralize with glacial acetic acid the remaining 90 cc. of the filtrate obtained in the test for *Substances not precipitated by ammonia*, add an excess of 1 cc. of glacial acetic acid and 2 cc. of freshly prepared potassium ferrocyanide T.S. No turbidity or pink color appears in 30 minutes (about 0.005 per cent Cu, or Zn).

Ferric Chloride, $FeCl_3.6H_2O$—Orange yellow or brown yellow, crystalline pieces. It is very deliquescent. Very soluble in water, freely soluble in alcohol, and soluble in glycerin and in ether. Ferric chloride and its solutions are partly reduced to ferrous chloride by exposure to light.

Insoluble—The insoluble matter from 10 Gm., dissolved in 100 cc. of water containing 1 cc. of hydrochloric acid, and washed with water containing 0.5 cc. of hydrochloric acid in each 100 cc., weighs not more than 1 mg. (0.01 per cent), page 729.

Nitrate, sulfate, alkali and earths, copper and zinc—Solution A—Dissolve 10 Gm. in 100 cc. of water, heat the solution to boiling, and pour it into a mixture of 140 cc. of water and 50 cc. of stronger ammonia T.S. Filter while still hot and wash with hot water until the filtrate measures 300 cc.

Nitrate—To 15 cc. of Solution A add 0.1 cc. of indigo carmine T.S. and 15 cc. of sulfuric acid: the blue color does not disappear in 5 minutes (about 0.01 per cent of NO_3).

Sulfate—Evaporate 60 cc. of Solution A to 20 cc., add 3 cc. of normal hydrochloric acid, dilute with water to 25 cc. and filter: the filtrate shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent). In making the blank, evaporate a volume of the stronger ammonia T.S., corresponding to the volume in the test, until free of ammonia.

Alkali and alkaline earths—To 30 cc. of Solution A, add 10 drops of sulfuric acid,

evaporate, and ignite cautiously: the weight of the residue does not exceed 1.0 mg. (0.1 per cent).

Copper and zinc—Neutralize 60 cc. of Solution A with glacial acetic acid, add an excess of 1 cc. of the acid, dilute to 100 cc., and add 2 cc. of freshly prepared 10 per cent potassium ferrocyanide solution: no turbidity or pink color appears in 15 minutes (about 0.005 per cent of Cu or Zn).

Phosphorus compounds—To 5 Gm. add 20 cc. of water and 20 cc. of nitric acid and evaporate on a steam bath to a syrup. Add 50 cc. of water, 15 cc. of nitric acid, and 13 cc. of stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake for 5 minutes at 40° to 50°, and allow to stand for 1 hour. Any precipitate formed should not be greater than is formed under the same conditions by 1.5 mg. of PO_4 (0.03 per cent PO_4).

Ferrous iron—Dissolve 0.5 Gm. of ferric chloride in 20 cc. of water and 1 cc. of hydrochloric acid and add 1 drop of a freshly prepared 5 per cent solution of potassium ferricyanide: no blue color is produced in 1 minute (about 0.002 per cent).

Keep protected from light.

Ferric Citrate, ($FeC_6H_5O_7.xH_2O$)—Thin, transparent, garnet red scales, or brown granules. Slowly soluble in water, more readily soluble in hot water, the solubility diminishing with age. It is insoluble in alcohol.

Assay—Weigh accurately about 1 Gm. of ferric citrate, dissolve it in a mixture of 5 cc. of reagent hydrochloric acid and 25 cc. of water in a glass-stoppered flask, warming if necessary, to aid solution. Cool, add 4 Gm. of potassium iodide, stopper the flask and allow it to stand for 15 minutes. Dilute it with 100 cc. of water and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator toward the end. Each cc. of tenth-normal sodium thiosulfate is equivalent to 5.585 mg. of Fe. It shows not less than 16.5 per cent and not more than 18.5 per cent of Fe.

Chloride—Heat 1 Gm. with 25 cc. of water and 2 cc. of nitric acid until dissolved. Cool, dilute to 100 cc. with water, and mix well. To 10 cc. of the solution add 1 cc. of silver nitrate T.S.: no turbidity is produced at once.

Sulfate—To 10 cc. of the solution obtained in the preceding test, add 1 cc. of barium nitrate T.S.: no turbidity is produced in 15 seconds.

Tartrate—Dissolve 500 mg. by heating it with 15 cc. of water on a water bath, then add to the solution 10 cc. of potassium hydroxide T.S., boil for a few minutes and filter. To half of the filtrate add 2 cc. of glacial acetic acid, cool, and allow to stand for 1 hour with frequent agitation: no white precipitate, soluble in ammonia T.S., is produced.

Alkali citrate—Ignite about 500 mg. until it is thoroughly charred, cool, and add 2 cc. of hot water. The water is neutral or shows only a slight alkaline reaction to litmus paper.

Ammonia—Heat 500 mg. with 5 cc. of sodium hydroxide T.S.: the odor of ammonia is not perceptible.

Ferrous Ammonium Sulfate, $Fe(NH_4)_2(SO_4)_2.6H_2O$—Pale, bluish green crystals or granules. One Gm. dissolves in about 6 cc. of water; insoluble in alcohol; it slowly oxidizes in the air. *Keep in tightly closed containers and protected from light.*

Assay—Weigh accurately about 1.5 Gm., dissolve in a mixture of 100 cc. of freshly boiled and cooled water and 8 cc. of sulfuric acid, and titrate with tenth-normal potas-

sium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 39.21 mg. of $Fe(NH_4)_2(SO_4)_2.6H_2O$: not less than 99.5 per cent and not more than 100.5 per cent of $Fe(NH_4)_2(SO_4)_2.6H_2O$ should be found.

Insoluble—Dissolve 10 Gm. in a mixture of 100 cc. of water and 1 cc. of sulfuric acid. If any insoluble residue remains, filter, wash well with water, and dry at 105°: the weight of the residue should not exceed 1 mg. (0.01 per cent).

Chloride—To a solution of 2 Gm. in 5 cc. of water add, slowly, 4 cc. of nitric acid. After the evolution of nitrogen oxides has ceased, dilute with water to 20 cc., filter, if necessary, and divide into two equal portions. To one portion add 0.5 cc. of silver nitrate T.S. and to the other portion add 0.5 cc. of water: the portion to which the silver nitrate was added is as clear as the other portion.

Phosphate—Dissolve 5 Gm. in 50 cc. of water and add, in small portions, 10 cc. of nitric acid. Gently boil the solution to expel the nitrogen oxides, then add stronger ammonia T.S. until the solution is only slightly acid. Add 50 cc. of ammonium molybdate T.S., shake for 5 minutes at about 40°, and let stand for 15 minutes: no yellow precipitate is formed.

Alkali and alkaline earths—Dissolve 5 Gm. in a mixture of 10 cc. of nitric acid and 75 cc. of water. Boil the solution until no more nitrogen oxides are evolved and pour, with stirring, into a mixture of 70 cc. of water and 20 cc. of stronger ammonia T.S. Filter, and wash with hot water until the filtrate measures 150 cc. Evaporate 60 cc. of the well-mixed filtrate to dryness, ignite, and weigh: the weight of residue does not exceed 1.0 mg. (0.05 per cent).

Copper, zinc—Neutralize the remainder of the filtrate from *alkali and alkaline earths* with glacial acetic acid, add an excess of 1 cc. of the acid, and follow with 2 cc of potassium ferrocyanide T.S.: no turbidity or pink color should appear in 30 minutes (about 0.005 per cent).

Ferric iron—Dissolve 1 Gm. in a mixture of 50 cc. of freshly boiled and cooled water and 1 cc. of sulfuric acid in a 125-cc. Erlenmeyer flask, and add 2 cc. of ammonium thiocyanate T.S. Any red color produced is not darker than that of a solution prepared as follows: Dissolve 140 mg. of iron wire (page 775) in 50 cc. of 20 per cent sulfuric acid in a 125-cc. Erlenmeyer flask closed by a Bunsen valve or a funnel with a water seal. After the reaction stops, add exactly 1 cc. of *standard solution of ferric ammonium sulfate*, page 730, and 2 cc. of ammonium thiocyanate T.S. (0.01 per cent).

Manganese—Dissolve 500 mg. in 3 cc. of water, add 2 cc. of nitric acid, and heat until brown fumes are no longer evolved. Cool, add 5 cc. of sulfuric acid, and heat to strong fumes of sulfur trioxide. Cool, add sufficient water to make 10 cc., then add 1 Gm. of lead dioxide, and heat to boiling. Transfer the mixture to a test tube cover, and allow to settle: the supernatant liquid should not be pink (about 0.01 per cent Mn).

Ferrous Sulfate, $FeSO_4.7H_2O$—Use *Ferrous Sulfate*, page 222.

Ferrous Sulfide, FeS—Grayish black lumps, fragments, sticks, granules, or globules. Insoluble in water but dissolved by dilute sulfuric or dilute hydrochloric acid with copious evolution of hydrogen sulfide. Contains at least 70 per cent of ferrous sulfide.

Filter Paper, Quantitative—For the Mercuric Bromide Test Paper used in testing for arsenic, use Swedish O filter paper or other makes of like surface, quality, and ash.

Formic Acid, HCOOH—Colorless liquid having a very pungent odor. It is *highly caustic.* Miscible with water and alcohol. Sp. gr. about 1.2.

Assay—Tare a flask containing about 10 cc. of water, then quickly add about 1 cc. of the acid, and reweigh. Dilute with 50 cc. of water and titrate with normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 46.03 mg. of HCO_2H. Not less than 85 per cent of HCO_2H should be found.

Non-volatile—Evaporate 40 cc. to dryness on a steam bath and dry at 105° for 2 hours. The weight of the residue does not exceed 1.0 mg. (0.002 per cent).

Substances precipitated by water—Dilute 5 cc. of the acid with 15 cc. of water: no turbidity is observed within 1 hour.

Acetic acid—Dilute 1 cc. with water to 100 cc. To 10 cc. of the dilution add 1.5 Gm. of yellow mercuric oxide, heat on a steam bath for 20 minutes and filter. The filtrate does not redden blue litmus paper in 30 seconds (about 0.4 per cent CH_3CO_2H).

Chloride—Dilute 4 cc. of the acid with 5 cc. of water, then add 3 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any turbidity produced corresponds to not more than 0.05 mg. of Cl (0.001 per cent Cl).

Sulfate—To 4 cc. of the acid add 20 mg. of anhydrous sodium carbonate and evaporate to dryness on a steam bath. Dissolve the residue in 5 cc. of water and 1 cc. of normal hydrochloric acid, filter if necessary, dilute with water to 10 cc. and add 1 cc. of barium chloride T.S. Any turbidity produced in 10 minutes is not greater than in a blank test to which 0.10 mg. of SO_4 has been added (0.002 per cent SO_4).

Sulfite—Mix 25 cc. of the acid with 25 cc. of water and add 0.1 cc. of tenth-normal iodine. The mixture retains a distinct yellow color (0.001 per cent SO_2).

Heavy metals—Evaporate 4 cc. of the acid in a porcelain dish to dryness on a water bath. Warm the residue with 10 cc. of water and 2 cc. of normal hydrochloric acid, dilute with water to 30 cc., and add 10 cc. of hydrogen sulfide T.S. Any darkening produced is not greater than in a control made with 0.025 mg. of Pb and 0.5 cc. of tenth-normal hydrochloric acid (5 parts per million).

Iron—Make the solution resulting from the test for *Heavy metals* alkaline with ammonia T.S. Any resulting green color is not darker than that produced by adding 0.03 mg. of iron to the control and making it alkaline with ammonia T.S.

Fuchsin, Basic—A mixture of rosaniline and pararosaniline hydrochlorides. Crystals or crystalline fragments with a glossy, greenish bronze luster. Soluble in water, in alcohol, and in amyl alcohol.

A solution (1 in 500) yields a red precipitate upon the addition of tannic acid T.S.

To 10 cc. of a solution (1 in 500) add 10 cc. of ammonia T.S. and 500 mg. of zinc dust and agitate the mixture: the solution becomes decolorized. Place a few drops of the decolorized solution upon filter paper and near by, on the same paper, place a few drops of dilute hydrochloric acid: a red color should develop at the zone of contact.

Loss on drying—When dried at 100° to constant weight, the loss does not exceed 5 per cent.

Residue on ignition—Ignite 1 Gm. to constant weight with 0.5 cc. of sulfuric acid: the weight of the residue does not exceed 3 mg. (0.3 per cent).

Furfural, **$C_4H_3O.CHO$—Furfural is a clear, colorless liquid when freshly distilled,** but soon turns yellowish brown to reddish brown. Soluble in water; miscible with alcohol. Specific gravity about 1.16. Not less than 95 per cent distils between 150° and 152°.

Keep in tight, light-resistant containers. Before use it should be freshly distilled.

Gallic Acid, $C_6H_2(OH)_3COOH.H_2O$—White, or nearly white crystals or powder. Sparingly soluble in cold water, very soluble in boiling water and in alcohol.

Distinction from tannic acid—A cold, saturated, solution of gallic acid neither colors nor precipitates solutions of pure ferrous salts and yields no precipitate with gelatin T.S.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid to constant weight: not more than 1.0 mg. of residue remains (0.1 per cent).

Sulfate—Dissolve 1 Gm. in 50 cc. of hot water, cool in ice water, and filter. Add to the filtrate 1 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S.: no turbidity is produced in 5 minutes (about 0.02 per cent SO_4).

Gelatin—Use *Gelatin*, page 232.

Glass Wool—Fine threads of glass.

Soluble substances—Boil 1 Gm. of glass wool for 30 minutes with diluted hydrochloric acid and filter. Evaporate the filtrate and dry the residue to constant weight at 105°: the residue weighs not more than 5.0 mg. (0.5 per cent).

Heavy metals—Boil 1 Gm. of glass wool for 5 minutes with a mixture of 25 cc. each of diluted nitric acid and water, filter, and evaporate the filtrate to dryness. Dissolve the residue in 10 cc. of water to which 3 drops of hydrochloric acid are added, again filter, and add an equal vclume of hydrogen sulfide T.S. to the filtrate: no darkening is produced.

Glycerin (*Glycerol*)—Use *Glycerin*, page 239.

Gold Chloride (*Chlorauric Acid*), $HAuCl_4.4H_2O$—Yellow, hygroscopic crystals. Very soluble in water, soluble in alcohol and in ether.

Assay—Weigh accurately about 200 mg., add 2 cc. of ammonium oxalate T.S., evaporate to dryness, and ignite to constant weight. The weight of the resulting metallic gold corresponds to not less than 47 per cent.

Other metals—Heat the metallic gold obtained in the assay with 5 cc. of dilute nitric acid (1 in 3) for 15 minutes on a water bath, add 15 cc. of water, and filter. Evaporate the filtrate to dryness on a water bath, add 1 cc. of glacial acetic acid and 40 cc. of water, and filter. To 20 cc. of the filtrate add 10 cc. of hydrogen sulfide T.S.: no appreciable coloration is produced. Now render the solution slightly alkaline with ammonia T.S.: not more than a slight greenish color develops.

Guanine Hydrochloride, $C_5H_5N_5O.HCl.H_2O$—White, crystalline powder. Melts above 250°, with decomposition. It is slightly soluble in water and in alcohol but soluble in acidulated water and in sodium hydroxide T.S. Its solution is not precipitated by iodine T.S. or by mercuric potassium iodide T.S., but forms a precipitate with trinitrophenol T.S.

***Residue on ignition*—Negligible from 100 mg.**

***Loss on drying*—It loses not more than 10 per cent at 110°.**

Hematoxylin (*Hydroxybrasilin*), $C_{16}H_{14}O_6.3H_2O$—A crystalline substance derived from the heart-wood of *Hæmatoxylon campechianum* Linné (Fam. *Leguminosæ*). Colorless to yellow prisms; very slightly soluble in cold water and in ether, readily soluble in hot water and in hot alcohol. When exposed to light, hematoxylin acquires a red color and yields a yellow solution. It dissolves in ammonia T.S. and in solutions of alkali hydroxides or carbonates. When dissolved in solutions of the following salts, hematoxylin develops the colors indicated: in alum solution a red color; in stannous chloride solution a rose color; in solutions of cupric salts a greenish gray color; and it gradually turns black in potassium dichromate solution.

Protect hematoxylin and its solution from light and air.

Hydrazine Sulfate, $(NH_2)_2H_2SO_4$—Colorless crystals or white, crystalline powder. Soluble in about 40 parts of water, insoluble in alcohol.

Assay—Weigh accurately 100 mg. of hydrazine sulfate, previously dried for 2 hours over sulfuric acid, and dissolve it in 20 cc. of water. Add to the solution 1 Gm. of sodium bicarbonate, and, after it has dissolved, titrate with tenth-normal iodine, using starch T.S. as indicator near the end of the reaction. Each cc. of tenth-normal iodine is equivalent to 3.253 mg. of hydrazine sulfate, and the assay should indicate not less than 99 per cent of $(NH_2)_2H_2SO_4$.

Residue on ignition—Not more than 0.1 per cent.

Chloride—Not more than 0.01 per cent, page 729.

Heavy metals—Dissolve 1 Gm. in 40 cc. of warm water and add 10 cc. of hydrogen sulfide T.S.: no darkening is produced.

Iron—Make the solution from the preceding test alkaline with ammonia T.S.: any resulting green color is not deeper than that of a control made with 0.01 mg. of Fe (10 parts per million).

Hydriodic Acid, (HI + water)—Nearly colorless, when freshly made, but rapidly becoming yellow to brown due to the liberation of iodine. Sp. gr. about 1.7. Boils at about 127°. Miscible with water and with alcohol. Keep in tight, light-resistant containers.

Assay and free iodine—Tare a stoppered flask containing about 10 cc. of water, then add about 0.5 cc. of the acid and reweigh. Dilute with 25 cc. of water and titrate the free iodine with tenth-normal sodium thiosulfate, using starch T.S. toward the end. Each cc. of tenth-normal sodium thiosulfate is equivalent to 12.69 mg. of iodine. Not more than 1.0 per cent of free iodine is found. Now titrate the solution with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide corresponds to 12.79 mg. of HI. Not less than 52 per cent of HI is present.

Non-volatile matter—To 6 cc. of the acid add 2 drops of sulfuric acid, evaporate in a porcelain crucible, and ignite to constant weight. The weight of the residue does not exceed 1.0 mg. (0.01 per cent).

Chloride or bromide—Dilute 1.2 cc. of the acid with water to 100 cc. and mix well. To 1.0 cc. of the dilution add a volume of standard sodium chloride solution, page 729, equivalent to 0.04 mg. of chloride ion, and dilute with water to 20 cc. Dilute 5 cc. of the dilution of the acid with water to 20 cc. Add to each aliquot 1 cc. of stronger ammonia T.S. and then add to each slowly, and with vigorous stirring, 2 cc. of 5 per cent silver nitrate solution. Heat to boiling for 5 minutes while stirring thoroughly, cool, shake well and filter. To the filtrates add nitric acid until neutral and

then 1 cc. more of the acid. The turbidity in the 5-cc. aliquot is not greater than the turbidity in the 1-cc. aliquot (0.05 per cent as Cl).

Phosphorus—To 6 cc. of the acid add 5 cc. of nitric acid and evaporate on a steam bath until the iodine is volatilized, re-evaporating the residue, if necessary, with several portions of water. Add to the residue 10 cc. of nitric acid. Dilute with 50 cc. of water and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the solution at about 40° for 5 minutes, and allow to stand for 30 minutes. Any precipitate formed is not greater than is produced when 1 cc. of standard phosphate solution, page 731, is treated in the same manner as in the test (0.0003 per cent P).

Sulfate—Dilute 3 cc. of the acid with 45 cc. of water and neutralize with ammonia water T.S., then add 1 cc. hydrochloric acid. Heat to boiling, add 3 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is formed, filter, wash thoroughly with hot water, ignite, and weigh. The weight of the ignited precipitate is not more than 1.3 mg. greater than the weight obtained from a blank test made with the same quantities of the reagent and in the same manner as with the acid, including filtration and ignition even if no precipitate is visible in the blank (0.01 per cent SO_4).

Heavy metals—To 1.2 cc. of the acid add 3 cc. of sulfuric acid and heat gently until the iodine is volatilized. Cool, cautiously add 20 cc. of water, neutralize to litmus paper with ammonia T.S., then add 1 cc. of tenth-normal hydrochloric acid, dilute with water to 30 cc., and add 10 cc. of hydrogen sulfide T.S. Any color produced is not darker than a control made with the same quantities of reagents and to which has been added 0.06 mg. of Pb (30 parts per million).

Iron—To the residue obtained in the test for *Non-volatile matter*, add 2 cc. of hydrochloric acid and 5 drops of nitric acid and warm until no more dissolves. Then dilute with water to 100 cc. To 20 cc. of the dilution, filtered if necessary, add 1 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S. Any red color produced is not greater than that of a control made with 0.04 mg. of Fe (20 parts per million).

Hydrochloric Acid, Reagent, HCl—A colorless, fuming liquid, having a pungent odor. Specific gravity about 1.18.

Assay—When assayed by the method outlined under *Hydrochloric Acid*, page 259, it contains not less than 35 per cent by weight of HCl.

Non-volatile matter—Evaporate 85 cc. of the acid to dryness in a platinum dish. Add a drop of sulfuric acid, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 0.5 mg. (0.0005 per cent).

Free chlorine—To 25 cc. of the acid add 25 cc. of freshly boiled water and cool: add 2 drops of 2 per cent potassium iodide solution and 1 cc. of carbon disulfide, and mix. The carbon disulfide should not acquire a pink color in 30 seconds (about 0.0002 per cent). NOTE—The potassium iodide used must be free from iodate

Sulfite—Add 0.05 cc. of tenth-normal iodine and a few drops of starch T.S. to 50 cc. of water, and then add 5 cc. of the acid, previously diluted with 50 cc. of water. The mixture should retain a blue color after mixing (about 0.003 per cent of SO_2).

Sulfate—Add about 100 mg. of anhydrous sodium carbonate to 20 cc. of the acid and evaporate to dryness. The residue, dissolved in 25 cc. of water, shows no more sulfate than corresponds to 0.05 mg. of SO_4 (0.0002 per cent), page 729.

Arsenic—Determine by the method outlined on page 618, using 17 cc. of the acid

for the generation of the hydrogen. The acid is to be diluted with 3 volumes of water and a correspondingly larger generator flask is to be used. The stain produced corresponds to not more than 0.002 mg. of As_2O_3 (0.1 part per million).

Heavy metals—Evaporate 10 cc. of the acid to dryness, moisten the residue with 5 drops of the acid, dilute to 35 cc. with water, and add 15 cc. of hydrogen sulfide T.S.: no darkening should be observed (about 3 parts per million).

Iron—To 40 cc. of the acid add about 50 mg. of potassium nitrate and evaporate in glass or porcelain to about 2 cc. Dilute with 20 cc. of water and add 2 cc. of ammonium thiocyanate T.S. Any reddish color produced is not greater than that produced by 0.05 mg. of Fe in an equal volume of solution containing the same quantities of the same reagents used in the test and 1 cc. of the acid (1 part per million).

Hydrochloric Acid, Diluted (10 per cent)—This acid is prepared by mixing 236 cc. of reagent hydrochloric acid with sufficient water to make 1000 cc.

Hydrofluoric Acid (HF + water)—Colorless or nearly colorless, fuming liquid. It readily attacks and dissolves glass and other siliceous materials. It is miscible with water and with alcohol. *Keep in tightly closed containers of paraffin, ceresin, or of other materials not corrodible by the acid.*

Assay for HF and fluosilicic acid—Tare accurately a stoppered platinum crucible containing about 5 cc. of water, then add quickly about 2 Gm. of the acid and reweigh. Place about 10 cc. of a saturated solution of potassium nitrate in a platinum dish, add a little less than the volume of normal sodium hydroxide required to neutralize the quantity of the acid weighed, and add 3 drops of phenolphthalein T.S. Cool the solution to about 0°, and slowly add to it the weighed acid, rinsing the platinum crucible with a small quantity of ice-cold water. Finally titrate with normal sodium hydroxide, while maintaining the temperature of the solution at nearly 0° until the pink color persists for 15 seconds. Note the total volume of normal sodium hydroxide consumed and designate it "A." Now heat the solution to 80° and titrate again to a permanent pink color. Designate the additional volume of sodium hydroxide as "B" and the weight of the acid taken for assay as "W," then: $\frac{2.001\,(A - 0.5\,B)}{W}$ represents the per cent of hydrogen fluoride (HF), and $\frac{3.602\,B}{W}$ represents the per cent of fluosilicic acid (H_2SiF_6). Not less than 46 per cent of HF should be found and not more than 0.25 per cent of fluosilicic acid. NOTE: The alkali used for this assay should be as free from silica as possible, otherwise incorrect results may be obtained.

Non-volatile—Evaporate 30 Gm. in a platinum dish and ignite *under a hood:* not more than 1.0 mg. of residue remains (0.003 per cent).

Chloride—Mix in a beaker 45 cc. of water, 2 cc. of nitric acid, and 0.5 cc. of silver nitrate T.S., and add 3 Gm. of the acid: any turbidity produced in 1 minute is not more than in a blank to which 0.1 mg. of chloride is added (0.003 per cent).

Sulfate—Evaporate 2 Gm. of the acid with 10 mg. of anhydrous sodium carbonate to dryness in a platinum dish on a steam bath *under a hood.* Moisten the residue with 1 cc. of normal hydrochloric acid and 5 cc. of water, filter, wash with water to 10 cc., and add 2 cc. of barium chloride T.S.: any turbidity produced is not greater than that of a control made with 0.10 mg. of sulfate (SO_4) (0.005 per cent).

Heavy metals and iron—Mix 30 cc. of water with 15 cc. of hydrogen sulfide T.S. in a beaker, add 5 Gm. of the acid, and immediately make alkaline with ammonia T.S.: no brown color appears. Any green color produced is not darker than that of a control made with 0.025 mg. of iron (5 parts per million).

Hydrogen Peroxide, 30 Per Cent—Clear, colorless liquid. Miscible with water. Specific gravity about 1.1.

Do not mix with any organic substances as explosions are liable to occur. Store in partly filled containers, preferably with a small vent in the closure, and in a cool place Handle with caution as it attacks the skin.

Assay—Tare a weighing bottle containing about 5 cc. of water, then add to it about 1 cc. of the hydrogen peroxide, and reweigh. Dilute with water to exactly 100 cc. and mix well. To 20 cc. of the dilution add 20 cc. of diluted sulfuric acid and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 1.701 mg. of H_2O_2. Not less than 28 per cent of H_2O_2 should be found.

Non-volatile—Evaporate 18 cc. to dryness on a steam bath and dry the residue at 105° for 2 hours. Not more than 1.0 mg. of residue remains (about 0.005 per cent).

Free acid—Dilute 9 cc. (10 Gm.) with 90 cc. of carbon dioxide-free water, add 3 drops of methyl red T.S., and titrate with fiftieth-normal sodium hydroxide. Not more than 0.3 cc. of the sodium hydroxide is required to produce a yellow color, correcting for any sodium hydroxide consumed by a blank.

Chloride—Dilute 2.7 cc. with 50 cc. of water and add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that in a control made with 0.03 mg. of Cl (0.001 per cent).

Nitrogen—To 5 cc. of the hydrogen peroxide add 1 drop of sulfuric acid and evaporate on a steam bath to about 2 cc. Transfer the residue to a Kjeldahl flask with the aid of 10 cc. of sulfuric acid containing 0.1 Gm. of salicylic acid. Allow to stand for 30 minutes, then add 200 mg. of sodium thiosulfate and 5 Gm. of potassium sulfate, and digest in the usual manner of nitrogen determination by the Kjeldahl method, page 671. Cool, dilute with 100 cc. of water, again cool, add 60 cc. of 30 per cent sodium hydroxide solution, and immediately connect the flask with a well-cooled condenser and a receiver containing 5 cc. of water and 1 drop of diluted hydrochloric acid. Distil until about 50 cc. of distillate has been collected, then add to the distillate 2 cc. of 10 per cent sodium hydroxide and 2 cc. of Nessler's reagent. The color produced is not darker than is produced by treating a quantity of ammonium chloride equivalent to 0.05 mg. of nitrogen in the same manner as the hydrogen peroxide (0.001 per cent N).

Phosphate—Evaporate 9 cc. to dryness on a steam bath. Add to the residue 10 cc. of nitric acid and 50 cc. of water and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake the mixture at about 40° for 5 minutes, and allow to stand for 30 minutes. Any yellow precipitate formed is not more than is produced when a quantity of potassium biphosphate, equivalent to 0.05 mg. of PO_4, is treated in the same manner (0.0005 per cent PO_4).

Sulfate—Dilute 2 cc. with 20 cc. of water, add 2 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. Any turbidity produced is not greater than in a control made with 0.1 mg. of SO_4 (0.005 per cent).

Heavy metals—Evaporate 2 cc. to dryness on a steam bath, warm the residue with

1 cc. of normal hydrochloric acid and 20 cc. of water, cool, and add 10 cc. of hydrogen sulfide T.S.: no darkening is produced.

Hydrogen Sulfide, H_2S—A colorless, poisonous gas; heavier than air. It is soluble in water. Generated by treating ferrous sulfide with diluted sulfuric or diluted hydrochloric acid. Other sulfides yielding hydrogen sulfide with diluted acids may be used. It is also available in compressed form in cylinders.

Hydroxylamine Hydrochloride, $NH_2OH.HCl$—Colorless crystals or a white, crystalline powder; very soluble in water, soluble in alcohol.

Assay—Weigh accurately about 100 mg. of hydroxylamine hydrochloride and dissolve it in 20 cc. of water. Add a solution of 5 Gm. of ferric ammonium sulfate, dissolved in 20 cc. of water, then add 15 cc. of diluted sulfuric acid, boil for 5 minutes, dilute with 200 cc. of water, and titrate the solution with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 3.475 mg. of $NH_2OH.HCl$. It shows not less than 95 per cent of $NH_2OH.HCl$.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid: not more than 1.0 mg. of residue remains.

Insoluble in alcohol—A solution of 1 Gm. in 25 cc. of alcohol is clear and colorless.

Sulfate—Dissolve 1 Gm. in 20 cc. of water, add 5 drops of diluted hydrochloric acid, heat to boiling, and add 1 cc. of barium chloride T.S.: no precipitate or turbidity is produced within 1 hour (about 0.01 per cent SO_4).

Ammonium salts—To the solution obtained in the test for *Insoluble in alcohol* add 1 cc. of platinic chloride T.S. The solution remains clear for 10 minutes (about 0.1 per cent NH_3).

Heavy metals—The heavy metals limit for hydroxylamine hydrochloride is 20 parts per million, using 1.0 Gm. for the test, page 730.

8-Hydroxyquinoline (*Oxine*), $HO.C_9H_6N$—White crystals or a white, crystalline powder. Insoluble in water, soluble in alcohol and in diluted acids.

Assay—Dry about 300 mg. over sulfuric acid for 18 hours, then weigh accurately about 150 mg. and dissolve it in 10 cc. of diluted reagent hydrochloric acid in a 500-cc. glass-stoppered flask. Add 50 cc. of tenth-normal bromine, immediately stopper the flask, and allow it to stand for 10 minutes. Cool in ice water, add 80 cc. of water and 10 cc. of potassium iodide T.S., and titrate the iodine liberated by the excess bromine with tenth-normal sodium thiosulfate. Each cc. of tenth-normal bromine corresponds to 3.627 mg. of $HO.C_9H_6N$. It contains not less than 99 per cent $HO.C_9H_6N$.

Melting range—Between 73° and 75°.

Residue on ignition—Ignite 2 Gm. with 1 cc. of sulfuric acid: not more than 1.0 mg. of residue remains.

Insoluble in alcohol—Dissolve 1 Gm. in 20 cc. of alcohol: a clear solution is formed and no insoluble residue remains.

Solubility in acetic acid—Add 1 Gm. to 50 cc. of acetic acid, diluted, and heat on a steam bath for 1 hour: a clear solution is formed and no insoluble residue remains.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.001 mg. (0.0001 per cent), page 729.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.015 mg. (0.0015 per cent), page 729.

Indicators—See page 845.

Indigo Carmine (*Sodium Indigotindisulfonate*), $C_{16}H_8N_2O_2(SO_3Na)_2$—A blue powder acquiring, when compressed, a coppery luster. It is sparingly soluble in water, yielding a dark blue solution. It is almost insoluble in alcohol.

Assay—Dry about 300 mg. of indigo carmine to constant weight at 100°; weigh accurately about 200 mg. of the dried salt, dissolve it in 10 cc. of water, add 1 cc. of sulfuric acid, and dilute in a porcelain dish with 600 cc. of water. Then titrate the solution with tenth-normal potassium permanganate. The end-point of the titration is the change in color from green to light yellow. Each cc. of tenth-normal potassium permanganate is equivalent to 11.65 mg. of $C_{16}H_8N_2O_2(SO_3Na)_2$. It shows not less than 85 per cent of $C_{16}H_8N_2O_2(SO_3Na)_2$.

Insoluble in water—Dissolve 1 Gm. of indigo carmine in 200 cc. of water, filter the solution through counterbalanced filters or a Gooch crucible, wash the residue and the filters with water until the washings cease to be colored blue, and dry at 100°: the insoluble residue does not exceed 20.0 mg. (2 per cent).

Starch or starch iodide—Boil 200 mg. of indigo carmine for 2 minutes with 10 cc. of water, cool, and then agitate the solution with small portions of bromine T.S. until the blue color disappears: no blue color is produced in this liquid by the addition of a few drops of potassium iodide T.S.

Iron ferri- or ferro-cyanide—Add 15 cc. of hydrogen peroxide T.S. and 10 cc. of sodium hydroxide T.S. to 200 mg. of the salt, shake the mixture until the blue color disappears, evaporate the liquid to about 10 cc., cool, acidulate with hydrochloric acid, and add a few drops of ferrous sulfate T.S.: the liquid does not become blue.

Iodine, I—Sublimed iodine in the form of bluish black plates.

Non-volatile—Vaporize 5 Gm. on a water bath to constant weight: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Chlorine and bromine—Triturate 5 Gm. of the powdered iodine with 25 cc. of water and allow to stand for 30 minutes with frequent stirring. Filter, and to 20 cc. of the filtrate add dilute sulfurous acid (1 in 10), drop by drop, until the color of iodine is just discharged. Add 1 cc. of ammonia T.S. and 1 cc. of tenth-normal silver nitrate. Filter, and to the clear filtrate add 2 cc. of nitric acid. The turbidity is not greater than is produced by 0.2 mg. of chloride ion in 20 cc. of water to which are added the same quantities of ammonia T.S., silver nitrate, and nitric acid used in the original test (0.005 per cent as Cl).

Iodine Pentoxide (*Iodic Anhydride*), I_2O_5—White, crystalline powder, soluble in water, insoluble in alcohol or in ether. When heated to about 300°, it decomposes into iodine and oxygen. When heated in the presence of sulfur or organic matter, deflagration takes place.

Assay—Dry about 500 mg. at 200° to constant weight, weigh accurately, and dissolve it in sufficient water to measure exactly 100 cc. Dilute 20 cc. of this solution with 30 cc. of water, add 2 Gm. of potassium iodide and 5 cc. of diluted sulfuric acid, allow to stand for 10 minutes in the dark, then titrate the liberated iodine with tenth-normal sodium thiosulfate. Correct for any iodine liberated in a blank made with

the same quantity of the reagents. Each cc. of tenth-normal sodium thiosulfate is equivalent to 2.782 mg. of I_2O_5. It shows not less than 98.5 per cent of I_2O_5.

Residue on ignition—Ignite 2 Gm. in a crucible to constant weight: the weight of the residue should not exceed 1.0 mg. (0.05 per cent).

Heavy metals—Add to the residue obtained in the test for *Residue on ignition* 1 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 730: the heavy metals limit for iodine pentoxide is 10 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.04 mg. of Fe (20 parts per million), page 730

Iron Wire, Fe—Bright, fine wire. Keep in well-closed containers.

Assay—Weigh accurately from 170 to 200 mg. of the clean, dry wire and transfer it to a 250-cc. or a 300-cc. flask. Add 50 cc. of diluted sulfuric acid and close the flask with a valve-stopper prepared as described in the assay under *Potassium Chlorate*, page 799. Heat until the wire is dissolved, then cool, dilute with 25 cc. of freshly boiled and cooled water, then titrate with tenth-normal potassium permanganate to the production of a slight pink color. Each cc. of tenth-normal potassium permanganate is equivalent to 5.585 mg. of Fe. It contains not less than 99.8 per cent of Fe.

Insoluble in sulfuric acid—To 2 Gm. of the iron wire add, in portions, a mixture of 4 cc. of sulfuric acid and 50 cc. of water and heat gently on a steam bath, if necessary, until hydrogen is no longer evolved. Filter the undissolved residue, wash it well, first with approximately 2 per cent sulfuric acid, then with water and dry at 105° to 110°. The weight of the residue does not exceed 2.4 mg. (0.12 per cent).

Isatin, $C_8H_5O_2N$—Small, yellowish red crystals, slightly soluble in water, soluble in alcohol and in ether. Water, alcohol, and ether solutions of isatin are reddish brown in color. When isatin is dissolved in a solution of an alkali hydroxide, it yields a violet-colored solution, which, upon heating or long standing, becomes yellow.

Melting range—From 198° to 201°.

Residue on ignition—Ignite 500 mg. to constant weight: the weight of the residue does not exceed 2.0 mg. (0.40 per cent).

Isobutyl Alcohol (*Isobutanol*), $(CH_3)_2CHCH_2OH$—A clear, colorless liquid having a characteristic odor. Specific gravity about 0.80. Soluble in about 10 volumes of water; miscible with alcohol or ether.

Boiling range—Determine by method II, page 625, using 50 cc. All of it should distil between 106° and 109°.

Non-volatile residue—Evaporate 25 cc. to dryness on a steam bath and dry for 1 hour at 110°: not more than 1.0 mg. of residue remains (0.005 per cent).

Water—A mixture of 5 cc. of the alcohol with 50 cc. of benzene is clear.

Acid—To 50 cc. of water add 2 drops of phenolphthalein T.S. and then fiftieth-normal sodium hydroxide until a pink color is produced. Disregard this quantity of the sodium hydroxide consumed. Then add 5 cc. of the isobutyl alcohol, mix and titrate with fiftieth-normal sodium hydroxide until the pink color is reproduced. The latter titration requires not more than 0.5 cc. of the sodium hydroxide solution.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.015 mg. (0.0015 per cent), page 729.

Indicators—See page 845.

Indigo Carmine (*Sodium Indigotindisulfonate*), $C_{16}H_8N_2O_2(SO_3Na)_2$—A blue powder acquiring, when compressed, a coppery luster. It is sparingly soluble in water, yielding a dark blue solution. It is almost insoluble in alcohol.

Assay—Dry about 300 mg. of indigo carmine to constant weight at 100°; weigh accurately about 200 mg. of the dried salt, dissolve it in 10 cc. of water, add 1 cc. of sulfuric acid, and dilute in a porcelain dish with 600 cc. of water. Then titrate the solution with tenth-normal potassium permanganate. The end-point of the titration is the change in color from green to light yellow. Each cc. of tenth-normal potassium permanganate is equivalent to 11.65 mg. of $C_{16}H_8N_2O_2(SO_3Na)_2$. It shows not less than 85 per cent of $C_{16}H_8N_2O_2(SO_3Na)_2$.

Insoluble in water—Dissolve 1 Gm. of indigo carmine in 200 cc. of water, filter the solution through counterbalanced filters or a Gooch crucible, wash the residue and the filters with water until the washings cease to be colored blue, and dry at 100°: the insoluble residue does not exceed 20.0 mg. (2 per cent).

Starch or starch iodide—Boil 200 mg. of indigo carmine for 2 minutes with 10 cc. of water, cool, and then agitate the solution with small portions of bromine T.S. until the blue color disappears: no blue color is produced in this liquid by the addition of a few drops of potassium iodide T.S.

Iron ferri- or ferro-cyanide—Add 15 cc. of hydrogen peroxide T.S. and 10 cc. of sodium hydroxide T.S. to 200 mg. of the salt, shake the mixture until the blue color disappears, evaporate the liquid to about 10 cc., cool, acidulate with hydrochloric acid, and add a few drops of ferrous sulfate T.S.: the liquid does not become blue.

Iodine, I—Sublimed iodine in the form of bluish black plates.

Non-volatile—Vaporize 5 Gm. on a water bath to constant weight: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Chlorine and bromine—Triturate 5 Gm. of the powdered iodine with 25 cc. of water and allow to stand for 30 minutes with frequent stirring. Filter, and to 20 cc. of the filtrate add dilute sulfurous acid (1 in 10), drop by drop, until the color of iodine is just discharged. Add 1 cc. of ammonia T.S. and 1 cc. of tenth-normal silver nitrate. Filter, and to the clear filtrate add 2 cc. of nitric acid. The turbidity is not greater than is produced by 0.2 mg. of chloride ion in 20 cc. of water to which are added the same quantities of ammonia T.S., silver nitrate, and nitric acid used in the original test (0.005 per cent as Cl).

Iodine Pentoxide (*Iodic Anhydride*), I_2O_5—White, crystalline powder, soluble in water, insoluble in alcohol or in ether. When heated to about 300°, it decomposes into iodine and oxygen. When heated in the presence of sulfur or organic matter, deflagration takes place.

Assay—Dry about 500 mg. at 200° to constant weight, weigh accurately, and dissolve it in sufficient water to measure exactly 100 cc. Dilute 20 cc. of this solution with 30 cc. of water, add 2 Gm. of potassium iodide and 5 cc. of diluted sulfuric acid, allow to stand for 10 minutes in the dark, then titrate the liberated iodine with tenth-normal sodium thiosulfate. Correct for any iodine liberated in a blank made with

the same quantity of the reagents. Each cc. of tenth-normal sodium thiosulfate is equivalent to 2.782 mg. of I_2O_5. It shows not less than 98.5 per cent of I_2O_5.

Residue on ignition—Ignite 2 Gm. in a crucible to constant weight: the weight of the residue should not exceed 1.0 mg. (0.05 per cent).

Heavy metals—Add to the residue obtained in the test for *Residue on ignition* 1 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 730: the heavy metals limit for iodine pentoxide is 10 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.04 mg. of Fe (20 parts per million), page 730.

Iron Wire, Fe—Bright, fine wire. Keep in well-closed containers.

Assay—Weigh accurately from 170 to 200 mg. of the clean, dry wire and transfer it to a 250-cc. or a 300-cc. flask. Add 50 cc. of diluted sulfuric acid and close the flask with a valve-stopper prepared as described in the assay under *Potassium Chlorate*, page 799. Heat until the wire is dissolved, then cool, dilute with 25 cc. of freshly boiled and cooled water, then titrate with tenth-normal potassium permanganate to the production of a slight pink color. Each cc. of tenth-normal potassium permanganate is equivalent to 5.585 mg. of Fe. It contains not less than 99.8 per cent of Fe.

Insoluble in sulfuric acid—To 2 Gm. of the iron wire add, in portions, a mixture of 4 cc. of sulfuric acid and 50 cc. of water and heat gently on a steam bath, if necessary, until hydrogen is no longer evolved. Filter the undissolved residue, wash it well, first with approximately 2 per cent sulfuric acid, then with water and dry at 105° to 110°. The weight of the residue does not exceed 2.4 mg. (0.12 per cent).

Isatin, $C_8H_5O_2N$—Small, yellowish red crystals, slightly soluble in water, soluble in alcohol and in ether. Water, alcohol, and ether solutions of isatin are reddish brown in color. When isatin is dissolved in a solution of an alkali hydroxide, it yields a violet-colored solution, which, upon heating or long standing, becomes yellow.

Melting range—From 198° to 201°.

Residue on ignition—Ignite 500 mg. to constant weight: the weight of the residue does not exceed 2.0 mg. (0.40 per cent).

Isobutyl Alcohol (*Isobutanol*), $(CH_3)_2CHCH_2OH$—A clear, colorless liquid having a characteristic odor. Specific gravity about 0.80. Soluble in about 10 volumes of water; miscible with alcohol or ether.

Boiling range—Determine by method II, page 625, using 50 cc. All of it should distil between 106° and 109°.

Non-volatile residue—Evaporate 25 cc. to dryness on a steam bath and dry for 1 hour at 110°: not more than 1.0 mg. of residue remains (0.005 per cent).

Water—A mixture of 5 cc. of the alcohol with 50 cc. of benzene is clear.

Acid—To 50 cc. of water add 2 drops of phenolphthalein T.S. and then fiftieth-normal sodium hydroxide until a pink color is produced. Disregard this quantity of the sodium hydroxide consumed. Then add 5 cc. of the isobutyl alcohol, mix and titrate with fiftieth-normal sodium hydroxide until the pink color is reproduced. The latter titration requires not more than 0.5 cc. of the sodium hydroxide solution.

Alkalinity—A solution of 1 cc. of the alcohol in 15 cc. of water does not affect moistened red litmus paper.

Fluorescence—The fluorescence, determined in a suitable fluorophotometer, is not greater than that of a solution containing 0.03 microgram of quinine sulfate in each cc. of tenth-normal sulfuric acid.

Isopropyl Alcohol (*Isopropanol*) $(CH_3)_2CHOH$—A colorless liquid; slight characteristic odor. Specific gravity 0.79. Miscible with water, alcohol, and ether. Not less than 94 per cent distils between 80° and 85°. Non-volatile, not more than 3 mg. from 6 cc. dried at 110° to constant weight (0.6 per cent). It conforms to the test for *Acid* under *Isobutyl Alcohol*, page 775.

Kerosene—A mixture of hydrocarbons, chiefly of the methane series. It is a clear, colorless liquid, possessing a characteristic, but not disagreeable odor. Specific gravity: about 0.80. It distils between 180° and 300°.

Lactose—Use *Lactose*, page 280.

Lead Acetate, $Pb(C_2H_3O_2)_2 . 3H_2O$—Use *Lead Acetate*, page 287.

Lead Carbonate (*Basic Lead Carbonate*), $(PbCO_3)_2 . Pb(OH)_2$—A white, heavy powder, insoluble in water or alcohol. Dissolved by acetic or diluted nitric acid.

Insoluble in acetic acid—Dissolve 5 Gm. by heating with 50 cc. of water and 7 cc. of glacial acetic acid. If an insoluble residue remains, filter, wash with a mixture of 100 volumes of water and 2 cc. of glacial acetic acid, and dry to constant weight at 105°: the weight of the residue does not exceed 2.5 mg. (0.05 per cent).

Chloride—The chloride in 1 Gm., dissolved in 2 cc. of nitric acid and 30 cc. of water, corresponds to not more than 0.05 mg. of Cl (0.005 per cent), page 729.

Nitrate—Dissolve 2 Gm. in 10 cc. of water and 4 cc. of glacial acetic acid, heating if necessary. Add about 10 mg. of sodium chloride and dilute to 20 cc. with water. To 10 cc. add 0.2 cc. of indigo carmine T.S., 10 cc. of sulfuric acid and stir thoroughly. The blue color does not entirely disappear in 10 minutes (0.005 per cent NO_3).

Alkali and alkaline earths—Dissolve 2 Gm. by heating with a mixture of 20 cc. of water and 3 cc. of nitric acid. Nearly neutralize with ammonia T.S., dilute to 100 cc. with water, completely precipitate the lead with hydrogen sulfide, and filter. To 50 cc. of the filtrate add a few drops of reagent sulfuric acid, evaporate to dryness, and ignite: the weight of the residue does not exceed 2.0 mg. (0.20 per cent).

Iron—Warm the residue obtained in the test for *Alkali and alkaline earths* with 1 cc. of hydrochloric acid and 2 drops of nitric acid. Dilute to 20 cc. with water; add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color produced should correspond to not more than that produced by 0.05 mg. of Fe under the same conditions (50 parts per million).

Zinc—Dissolve 3 Gm. in a mixture of 25 cc. of water and 5 cc. of glacial acetic acid, dilute with water to 42 cc., add, with stirring, 3 cc. of sulfuric acid, and filter. To 30 cc. of the filtrate add 5 drops of nitric acid, heat to boiling, and pour into a mixture of 10 cc. of stronger ammonia T. S. and 20 cc. of water. Filter while hot and wash with 2 cc. of hot water. Neutralize with glacial acetic acid and add 1 cc. of the acid in excess, cool, and add 2 cc. of freshly prepared potassium ferrocyanide T.S.: no turbidity should appear in 10 minutes.

Lead Dioxide (*Lead Peroxide*), PbO_2—A dark brown powder. Insoluble in water and in alcohol; insoluble in nitric acid; decomposed by hydrochloric acid with the evolution of chlorine. It is dissolved by concentrated solutions of alkali hydroxides.

Assay—Treat 500 mg., accurately weighed, with 15 cc. of dilute nitric acid (1 in 2), add from a pipette 20 cc. of hydrogen peroxide solution (1 volume of hydrogen peroxide T.S. and 3 volumes of water) and stir until solution is complete. Solution can be hastened, if necessary, by the addition of 100 cc. of warm water. Titrate the excess of hydrogen peroxide with tenth-normal potassium permanganate. Titrate also 20 cc. of the diluted hydrogen peroxide, treated with 15 cc. of the nitric acid (1 in 2). Each cc. of tenth-normal potassium permanganate is equivalent to 11.96 mg. of PbO_2. The difference between the 2 titrations corresponds to not less than 90 per cent of PbO_2.

Acid-insoluble matter—To 1 Gm. of the lead dioxide add 25 cc. of water and 3 cc. of nitric acid; add, with stirring, 5 cc. of hydrogen peroxide T.S. or more, if needed, to dissolve all of the lead dioxide. Filter through asbestos in a Gooch crucible, wash, and dry to constant weight at from 105° to 110°. The weight of the residue should not exceed 3.0 mg. (0.30 per cent). (Reserve the filtrate from this test to test for *substances not precipitated by hydrogen sulfide*.)

Chloride—Dissolve 1 Gm. in a mixture of 15 cc. of diluted acetic acid and 10 cc. of hydrogen peroxide T.S. Filter, and dilute to 50 cc. with water. To 10 cc. of this solution add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that produced by 0.01 mg. of chloride ion in an equal volume of solution containing the same quantities of the same reagents used in the test (about 0.005 per cent Cl).

Nitrate—Boil 2 Gm. with a mixture of 5 cc. of glacial acetic acid and 15 cc. of water for 5 minutes. Cool, dilute to the original volume, and filter. Superimpose 10 cc. of the clear filtrate upon 10 cc. of diphenylamine T.S.: no blue ring should develop at the zone of contact within 20 minutes (about 0.005 per cent NO_3).

Sulfate—To 4 Gm. add 10 cc. of hydrochloric acid and 3 cc. of nitric acid and evaporate to dryness on a water bath. Add 25 cc. of water and 4 Gm. of anhydrous sodium carbonate and digest on a water bath for 3 hours with occasional stirring. Dilute to 100 cc. with water, mix well, and filter. Neutralize 50 cc. of the filtrate with reagent hydrochloric acid, then add 5 drops more of the acid, heating the solution to boiling. Add 5 cc. of barium chloride T.S. and allow to stand over night. If a precipitate is present, proceed as directed for the determination of sulfur compounds under dibasic ammonium phosphate, page 740. The weight of the barium sulfate is not greater than 5.0 mg. (0.10 per cent SO_4).

Manganese—Decompose 5 Gm. with 15 cc. of hydrochloric acid. Add 10 cc. of sulfuric acid and evaporate until it fumes. Cool and cautiously add 20 cc. of water. Add 500 mg. of the lead peroxide, heat on a water bath for 5 minutes, dilute to 50 cc., and filter through asbestos. The color is not greater than that produced by 0.015 mg. of Mn treated with the same quantities of the same acids and reagent used in the original test (3 parts per million).

Other metals precipitated by hydrogen sulfide—Dissolve 500 mg. in 5 cc. of nitric acid and 10 cc. of hydrogen peroxide T.S. Add 5 cc. of sulfuric acid and evaporate until it fumes. Cautiously dilute to 50 cc. with water and allow to stand until the solution is cool and the precipitate has settled. Filter, but do not wash, and pass hydrogen sulfide gas through the filtrate: no red color should be produced, and any

darkening is not greater than that caused by 0.1 mg. of lead in the same volume of solution when hydrogen sulfide is added.

Substances not precipitated by hydrogen sulfide—Evaporate to dryness the filtrate obtained in the test for *acid-insoluble matter,* moisten the residue with 5 drops of hydrochloric acid, and dissolve in 100 cc. of hot water. Pass in hydrogen sulfide gas until all of the lead is precipitated, and filter without washing. Evaporate 50 cc. of the filtrate to dryness and ignite gently. The weight of the residue, after correcting for the non-volatile matter in the hydrogen peroxide, does not exceed 2.5 mg. (0.50 per cent).

Lead Monoxide (*Litharge*), PbO—A heavy, yellowish, or reddish yellow powder. It is insoluble in water and in alcohol; soluble in acetic acid and in diluted nitric acid; also soluble in warm solutions of the fixed alkali hydroxides.

Assay—Weigh accurately about 300 mg. of the freshly ignited lead monoxide and dissolve it by warming with 10 cc. of water and 1 cc. of glacial acetic acid in a 200-cc. volumetric flask. Dilute with 75 cc. of water, heat to boiling, add exactly 50 cc. of tenth-normal potassium dichromate and boil for 2 to 3 minutes. Cool, dilute with water to the 200 cc. mark, mix well and allow to subside. Withdraw exactly 100 cc. of the clear liquid and transfer it to a glass-stoppered flask. Add 10 cc. of diluted sulfuric acid and 1 Gm. of potassium iodide, stopper, mix gently and allow to stand for 10 minutes. Then titrate the liberated iodine, representing the excess of the dichromate, with tenth-normal sodium thiosulfate, adding starch T.S. near the end. Each cc. of tenth-normal potassium dichromate is equivalent to 7.440 mg. of PbO. Not less than 98 per cent of PbO should be found.

Insoluble in acetic acid—To 2 Gm. of the oxide add a mixture of 15 cc. of glacial acetic acid and 15 cc. of water, boil gently for 5 minutes, filter, wash the insoluble residue with diluted acetic acid and dry to constant weight at 110°: the weight of the residue is not more than 10.0 mg. (0.50 per cent).

Volatile substances—Weigh accurately about 5 Gm. and heat strongly in a covered porcelain crucible: the loss in weight does not exceed 2 per cent of the weight of the oxide taken.

Alkali and alkaline earths—Completely precipitate the lead from the filtrate obtained in the test for *Insoluble in acetic acid* by passing into it hydrogen sulfide, filter, and wash the precipitate with 20 cc. of water. To one-half of the mixed filtrate and washings add 5 drops of sulfuric acid, evaporate to dryness, and ignite: the weight of the residue does not exceed 5.0 mg. (0.50 per cent).

Lead Nitrate, $Pb(NO_3)_2$—Colorless or white crystals or a white, crystalline powder. Very soluble in water; very slightly soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Chloride—The chloride in 2 Gm., acidulating the solution with 5 drops of nitric acid, corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 729.

Copper and iron—Dissolve 5 Gm. in about 40 cc. of water, add 5 cc. of sulfuric acid, evaporate, and heat until fumes of SO_3 are evolved. Cool, mix with about 50 cc. of water, filter, and wash the precipitate with 20 cc. of water. Divide the filtrate into two equal portions for the following tests:

Copper—Heat one-half of the filtrate to boiling, add a slight excess of ammonia T.S., and filter. Acidify the filtrate with acetic acid and add 1 cc. of freshly prepared

potassium ferrocyanide T.S.: no red color should be produced in 10 minutes (about 20 parts per million of Cu).

Iron—To the second half of the filtrate, add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S.: any red color produced is not greater than is produced by 0.05 mg. of Fe under the same conditions (20 parts per million of Fe).

Substances not precipitated by hydrogen sulfide—Dissolve 2 Gm. in 100 cc. of water and pass hydrogen sulfide gas through the solution to precipitate the lead completely. Filter, and to 50 cc. of the filtrate add 5 drops of sulfuric acid, evaporate to dryness, and ignite: the weight of the ignited residue should not exceed 1.0 mg. (0.10 per cent).

Lead Subacetate (*Basic Lead Acetate*), $Pb(C_2H_3O_2)_2.2Pb(OH)_2$—A heavy, white powder, readily absorbing carbon dioxide from air. It is soluble in water, usually incompletely; slightly soluble in alcohol. Keep in tight containers.

Assay for total lead—Weigh accurately about 1 Gm. of lead subacetate in a porcelain crucible, add about 0.5 cc. of sulfuric acid, and ignite to constant weight. The weight of the lead sulfate corresponds to not less than 70 per cent and not more than 73 per cent of Pb.

Assay for basic lead—Dissolve 500 mg. in 50 cc. of tenth-normal acetic acid, add 20 cc. of sodium oxalate solution (1 in 50), dilute with water to 100 cc., mix well, and filter. Titrate 50 cc. with tenth-normal sodium hydroxide using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal acetic acid is equivalent to 11.16 mg. of PbO. Not less than 33 per cent is found.

Insoluble in acetic acid—Dissolve 6 Gm. in 100 cc. of water and 5 cc. of glacial acetic acid, warming if necessary. If an insoluble residue remains, filter and wash with water until the washings are no longer darkened by hydrogen sulfide. Dry to constant weight at 105°: the weight does not exceed 3.0 mg. (0.05 per cent).

Chloride—One Gm. shows no more chloride than corresponds to 0.05 mg. of Cl (0.005 per cent), page 729.

Solution A—Dissolve 5 Gm. in a mixture of 42 cc. of water and 3 cc. of glacial acetic acid. Add 5 cc. of sulfuric acid, allow to stand for 10 minutes, and filter.

Nitrate—To 10 cc. of Solution A add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid: the blue color does not disappear in 5 minutes (0.003 per cent NO_3).

Copper—To 25 cc. of Solution A, add stronger ammonia T.S. until barely alkaline, heat on a steam bath for 10 minutes, and add 10 cc. of stronger ammonia T.S. No blue color should be observed in the solution when compared with an equal volume of water (about 50 parts per million of Cu).

Substances not precipitated by hydrogen sulfide—Dilute 10 cc. of Solution A with water to 100 cc., pass in hydrogen sulfide gas to precipitate all of the lead, and filter. Evaporate 50 cc. of the filtrate to dryness and ignite gently to constant weight: the weight of the residue does not exceed 1.5 mg. (0.30 per cent).

Keep in tight containers.

Lime—Use *Calcium Oxide*, page 751.

Lime, Freshly Slaked—Use *Calcium Oxide, Freshly Slaked*, page 752.

Litmus—A blue pigment prepared from various species of *Roccella* DeCandolle, *Lecanora* Acharius, or other lichens (Fam. *Parmeliaceæ*).

darkening is not greater than that caused by 0.1 mg. of lead in the same volume of solution when hydrogen sulfide is added.

Substances not precipitated by hydrogen sulfide—Evaporate to dryness the filtrate obtained in the test for *acid-insoluble matter*, moisten the residue with 5 drops of hydrochloric acid, and dissolve in 100 cc. of hot water. Pass in hydrogen sulfide gas until all of the lead is precipitated, and filter without washing. Evaporate 50 cc. of the filtrate to dryness and ignite gently. The weight of the residue, after correcting for the non-volatile matter in the hydrogen peroxide, does not exceed 2.5 mg. (0.50 per cent).

Lead Monoxide (*Litharge*), PbO—A heavy, yellowish, or reddish yellow powder. It is insoluble in water and in alcohol; soluble in acetic acid and in diluted nitric acid; also soluble in warm solutions of the fixed alkali hydroxides.

Assay—Weigh accurately about 300 mg. of the freshly ignited lead monoxide and dissolve it by warming with 10 cc. of water and 1 cc. of glacial acetic acid in a 200-cc. volumetric flask. Dilute with 75 cc. of water, heat to boiling, add exactly 50 cc. of tenth-normal potassium dichromate and boil for 2 to 3 minutes. Cool, dilute with water to the 200 cc. mark, mix well and allow to subside. Withdraw exactly 100 cc. of the clear liquid and transfer it to a glass-stoppered flask. Add 10 cc. of diluted sulfuric acid and 1 Gm. of potassium iodide, stopper, mix gently and allow to stand for 10 minutes. Then titrate the liberated iodine, representing the excess of the dichromate, with tenth-normal sodium thiosulfate, adding starch T.S. near the end. Each cc. of tenth-normal potassium dichromate is equivalent to 7.440 mg. of PbO. Not less than 98 per cent of PbO should be found.

Insoluble in acetic acid—To 2 Gm. of the oxide add a mixture of 15 cc. of glacial acetic acid and 15 cc. of water, boil gently for 5 minutes, filter, wash the insoluble residue with diluted acetic acid and dry to constant weight at 110°: the weight of the residue is not more than 10.0 mg. (0.50 per cent).

Volatile substances—Weigh accurately about 5 Gm. and heat strongly in a covered porcelain crucible: the loss in weight does not exceed 2 per cent of the weight of the oxide taken.

Alkali and alkaline earths—Completely precipitate the lead from the filtrate obtained in the test for *Insoluble in acetic acid* by passing into it hydrogen sulfide, filter, and wash the precipitate with 20 cc. of water. To one-half of the mixed filtrate and washings add 5 drops of sulfuric acid, evaporate to dryness, and ignite: the weight of the residue does not exceed 5.0 mg. (0.50 per cent).

Lead Nitrate, $Pb(NO_3)_2$—Colorless or white crystals or a white, crystalline powder. Very soluble in water; very slightly soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Chloride—The chloride in 2 Gm., acidulating the solution with 5 drops of nitric acid, corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 729.

Copper and iron—Dissolve 5 Gm. in about 40 cc. of water, add 5 cc. of sulfuric acid, evaporate, and heat until fumes of SO_3 are evolved. Cool, mix with about 50 cc. of water, filter, and wash the precipitate with 20 cc. of water. Divide the filtrate into two equal portions for the following tests:

Copper—Heat one-half of the filtrate to boiling, add a slight excess of ammonia T.S., and filter. Acidify the filtrate with acetic acid and add 1 cc. of freshly prepared

potassium ferrocyanide T.S.: no red color should be produced in 10 minutes (about 20 parts per million of Cu).

Iron—To the second half of the filtrate, add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S.: any red color produced is not greater than is produced by 0.05 mg. of Fe under the same conditions (20 parts per million of Fe).

Substances not precipitated by hydrogen sulfide—Dissolve 2 Gm. in 100 cc. of water and pass hydrogen sulfide gas through the solution to precipitate the lead completely. Filter, and to 50 cc. of the filtrate add 5 drops of sulfuric acid, evaporate to dryness, and ignite: the weight of the ignited residue should not exceed 1.0 mg. (0.10 per cent).

Lead Subacetate (*Basic Lead Acetate*), $Pb(C_2H_3O_2)_2.2Pb(OH)_2$—A heavy, white powder, readily absorbing carbon dioxide from air. It is soluble in water, usually incompletely; slightly soluble in alcohol. Keep in tight containers.

Assay for total lead—Weigh accurately about 1 Gm. of lead subacetate in a porcelain crucible, add about 0.5 cc. of sulfuric acid, and ignite to constant weight. The weight of the lead sulfate corresponds to not less than 70 per cent and not more than 73 per cent of Pb.

Assay for basic lead—Dissolve 500 mg. in 50 cc. of tenth-normal acetic acid, add 20 cc. of sodium oxalate solution (1 in 50), dilute with water to 100 cc., mix well, and filter. Titrate 50 cc. with tenth-normal sodium hydroxide using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal acetic acid is equivalent to 11.16 mg. of PbO. Not less than 33 per cent is found.

Insoluble in acetic acid—Dissolve 6 Gm. in 100 cc. of water and 5 cc. of glacial acetic acid, warming if necessary. If an insoluble residue remains, filter and wash with water until the washings are no longer darkened by hydrogen sulfide. Dry to constant weight at 105°: the weight does not exceed 3.0 mg. (0.05 per cent).

Chloride—One Gm. shows no more chloride than corresponds to 0.05 mg. of Cl (0.005 per cent), page 729.

Solution A—Dissolve 5 Gm. in a mixture of 42 cc. of water and 3 cc. of glacial acetic acid. Add 5 cc. of sulfuric acid, allow to stand for 10 minutes, and filter.

Nitrate—To 10 cc. of Solution A add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid: the blue color does not disappear in 5 minutes (0.003 per cent NO_3).

Copper—To 25 cc. of Solution A, add stronger ammonia T.S. until barely alkaline, heat on a steam bath for 10 minutes, and add 10 cc. of stronger ammonia T.S. No blue color should be observed in the solution when compared with an equal volume of water (about 50 parts per million of Cu).

Substances not precipitated by hydrogen sulfide—Dilute 10 cc. of Solution A with water to 100 cc., pass in hydrogen sulfide gas to precipitate all of the lead, and filter. Evaporate 50 cc. of the filtrate to dryness and ignite gently to constant weight: the weight of the residue does not exceed 1.5 mg. (0.30 per cent).

Keep in tight containers.

Lime—Use *Calcium Oxide*, page 751.

Lime, Freshly Slaked—Use *Calcium Oxide, Freshly Slaked*, page 752.

Litmus—A blue pigment prepared from various species of *Roccella* DeCandolle, *Lecanora* Acharius, or other lichens (Fam. *Parmeliaceæ*).

Description—Cubes, masses, fragments, or granules, of an indigo blue or deep violet color. It has the combined odor of indigo and violets, tinges the saliva a deep blue, and is somewhat pungent and saline to the taste. The indicator substances contained in litmus are soluble in water and less soluble or insoluble in alcohol.

Ash—Litmus yields not more than 60 per cent of ash.

Magnesium Chloride, $MgCl_2.6H_2O$—White, deliquescent crystals, very soluble in water.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent), page 729.

Nitrate—Dissolve 2 Gm. in 10 cc. of water, add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid. The blue color should not entirely disappear in 5 minutes (about 0.002 per cent NO_3).

Phosphate—To 10 Gm. add 15 cc. of nitric acid and evaporate to a small volume. Treat with a mixture of 5 cc. of nitric acid and 40 cc. of water, and add ammonia T.S. until a precipitate begins to form. Clear the solution by adding sufficient nitric acid, and then add 50 cc. of ammonium molybdate T.S. Shake the mixture for 5 minutes at a temperature of 40° and allow to stand for 1 hour. Any yellow precipitate produced is not greater than that produced when 0.5 cc. of standard phosphate solution, page 731, is treated in the same manner as in the test (0.0005 per cent PO_4).

Sulfate—The sulfate in 2 Gm. corresponds to not more than 0.04 mg. of SO_4 (0.002 per cent), page 729.

Alkali salts—Dissolve 2 Gm. in 10 cc. of 95 per cent alcohol: no residue or turbidity should be evident.

Ammonia—Dissolve 2 Gm. in 90 cc. of water and add 10 cc. of 10 per cent sodium hydroxide solution. Allow to settle and decant 50 cc., add 2 cc. of Nessler's reagent. The color is not greater than that produced by 0.02 mg. of NH_3 in 45 cc. of water, 5 cc. of the sodium hydroxide solution, and 2 cc. of Nessler's reagent (0.002 per cent NH_3).

Barium—Dissolve 1 Gm. in 10 cc. of water and add 1 cc. of normal sulfuric acid. At the end of 30 minutes the solution should not be more turbid than a similar solution to which no sulfuric acid has been added (about 0.005 per cent Ba).

Calcium—Dissolve 2.5 Gm. in 50 cc. of 95 per cent alcohol, add 25 cc. of dilute sulfuric acid (1 in 5), and allow to stand over night: no precipitate or turbidity should be produced. If crystals separate, warm the solution slightly (about 0.01 per cent Ca).

Heavy metals—The heavy metals limit for magnesium chloride is 5 parts per million, using 3 Gm. for the test, page 730.

Iron—Dissolve 2 Gm. in 25 cc. of water, heat to boiling, add 5 drops of nitric acid, boil for a few minutes, cool, and dilute to 25 cc. Add 2 cc. of reagent hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color developed should be not greater than that produced by 0.01 mg. of Fe in the same volume of solution containing the same quantities of the same reagents used in the test (5 parts per million).

Magnesium Oxide, MgO—Use *Magnesium Oxide*, page 296.

Magnesium Sulfate, $MgSO_4.7H_2O$—Use *Magnesium Sulfate*, page 298.

Manganese Sulfate, $MnSO_4.nH_2O$—Pink crystals. Very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Water of hydration—Weigh accurately about 2 Gm., heat it at 150° for 2 hours, and ignite to constant weight at from 400° to 500°: the loss in weight corresponds to not more than 33 per cent.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.05 mg. of Cl (0.005 per cent), page 729.

Alkali and alkaline earths—Dissolve 2 Gm. in about 90 cc. of water and add sufficient ammonium sulfide T.S. to precipitate the manganese completely. Heat on a water bath for about 30 minutes, cool, dilute with water to 100 cc., mix well, and filter. Evaporate 50 cc. of the filtrate to dryness and ignite the residue to constant weight: the weight of the residue does not exceed 2.5 mg. (0.25 per cent).

Heavy metals—Dissolve 1 Gm. of manganese sulfate in 20 cc. of water and add 1 cc. of normal hydrochloric acid. Dissolve 1 Gm. of the manganese sulfate in 10 cc. of water, add 1 cc. of normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no difference in color should be noticeable between the two solutions.

Iron—Dissolve 1 Gm. in 15 cc. of water, add 3 drops of nitric acid and heat to boiling. Cool and dilute with water to 25 cc., add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color developed should not be darker than that produced by 0.02 mg. of Fe in an equal volume of solution treated with the same quantities of the same reagents used in the test (20 parts per million).

Zinc—Dissolve 1 Gm. in 20 cc. of water and to 10 cc. of the solution add 10 cc. of hydrogen sulfide T.S.: no turbidity which can be cleared up by hydrochloric acid is produced in 2 minutes.

Substances reducing permanganate—Mix 200 cc. of water with 3 cc. of sulfuric acid and 3 cc. of phosphoric acid and add tenth-normal potassium permanganate until a slight pink color is produced. Disregard the volume of potassium permanganate used. Then dissolve in the mixture 10 Gm. of manganese sulfate and add 0.10 cc. of tenth-normal potassium permanganate: the pink color persists for not less than 1 minute.

Mercuric Bromide, $HgBr_2$—White or faintly yellow crystals or a crystalline powder. Slightly soluble in cold water, soluble in boiling water, soluble in alcohol.

Residue on ignition—Ignite 5 Gm. with 2 cc. of sulfuric acid to constant weight, the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Insoluble in methanol—Dissolve 2 Gm. in 30 cc. of methanol. If an insoluble residue remains, filter through asbestos in a Gooch crucible, wash with methanol until the washings remain unaffected by hydrogen sulfide and dry at from 105° to 110°. The weight of the residue does not exceed 2.0 mg. (0.10 per cent).

Chloride—Weigh accurately about 700 mg. and moisten with 5 cc. of water and 1 cc. of acetic acid. Add 5 Gm. of coarsely powdered zinc (20 to 30 mesh) and warm gently, shaking frequently until the supernatant liquid becomes clear (about 10 minutes). Filter, wash, and to the combined filtrate and washings, add 2 cc. of ferric ammonium sulfate T.S., 3 cc. of nitric acid, and 50 cc. of tenth-normal silver nitrate. Filter, wash, and titrate the excess silver nitrate with tenth-normal ammonium thiocyanate. The volume of silver nitrate consumed corresponds to not more than 55.9 cc. per Gm. of mercuric bromide (about 0.5 per cent Cl).

Mercuric Chloride—Use *Mercury Bichloride*, page 783.

Mercuric Iodide, Red, HgI_2—A scarlet red powder. Insoluble in water; sparingly soluble in alcohol and in ether; readily dissolved by solutions of alkali iodides.

Assay—Weigh accurately about 200 mg. of red mercuric iodide, previously dried for 18 hours over sulfuric acid, and transfer it completely to a glass-stoppered flask. Add a cooled mixture of 30 cc. of hydrochloric acid, 20 cc. of water and 5 cc. of chloroform. Rotate the flask until the mercuric iodide dissolves, then titrate the solution with twentieth-molar potassium iodate until the iodine color disappears from the water layer. Stopper the flask, shake thoroughly for 30 seconds, then continue the titration, shaking vigorously after each addition of the iodate solution until the iodine color just disappears from the chloroform. Each cc. of twentieth-molar potassium iodate is equivalent to 22.72 mg. of HgI_2, and not less than 99 per cent of HgI_2 is found.

Residue on ignition—Not more than 0.1 per cent.

Solubility in potassium iodide—A 10-Gm. portion dissolves completely or practically so in a solution of 10 Gm. of potassium iodide in 100 cc. of water.

Mercurous mercury—To the solution resulting from the preceding test and contained in a glass-stoppered flask, add 5 cc. of tenth-normal iodine and 3 cc. of normal hydrochloric acid. Allow to stand in the dark for 1 hour with frequent agitation, then titrate the excess of iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Not more than 0.5 cc. of the tenth-normal iodine is consumed, correction being made for any iodine consumed in a blank test (0.1 per cent mercurous Hg).

Soluble mercury salts—Shake 1 Gm. with 25 cc. of water for 2 minutes, filter, and add to the filtrate 10 cc. of hydrogen sulfide T.S. If a color is produced, it is not darker than a blank to which 0.70 mg. of mercury bichloride has been added (about 0.05 per cent as Hg).

Mercuric Oxide, Yellow, HgO—Use *Yellow Mercuric Oxide*, page 308.

Mercurous Chloride, Mild, HgCl—Use *Mild Mercurous Chloride*, page 311.

Mercurous Nitrate, ($HgNO_3$, about $1H_2O$)—Colorless crystals. Soluble in a small amount of water, but decomposed by much water into the basic salt.

Insoluble—Dissolve 2 Gm. in 20 cc. of diluted nitric acid: the resulting solution is clear and complete.

Residue on ignition—Ignite 2 Gm.: the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Dissolve 3 Gm. in 10 cc. of diluted nitric acid. Add to the solution, with stirring, 15 cc. of 10 per cent sodium hydroxide solution and digest on a water bath for 1 hour. Dilute to 30 cc. with water, cool, and filter. Use this solution in the following tests:

Chloride—A 10-cc. portion of the above filtrate shows no more chloride than corresponds to 0.1 mg. of Cl (0.01 per cent), page 729.

Sulfate—Another 10-cc. portion of the above filtrate shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.01 per cent), page 729.

Mercuric mercury—Dissolve 1 Gm. in 5 cc. of diluted nitric acid, dilute with 45 cc. of water and add, with stirring, 1 cc. of hydrochloric acid. Filter, and to 10 cc. of the filtrate add 10 cc. of hydrogen sulfide T.S. The resulting color is not darker

than that produced in a control made with 1.5 mg. of mercuric chloride in an equal volume of solution made with the same quantities of the same reagents used in the test (0.55 per cent of mercuric Hg).

Mercury, Hg—Use *Mercury*, page 312.

Mercury Bichloride (*Mercuric Chloride*) $HgCl_2$—Heavy, colorless, odorless crystals, crystalline masses, or a white powder; soluble in water, in alcohol, in glycerin, and in ether; more soluble in boiling water and in boiling alcohol.

Loss on drying—When dried over sulfuric acid for 18 hours, it loses not more than 1 per cent of its weight.

Residue on ignition—Volatilizes when strongly heated, leaving not more than 0.1 per cent of residue.

Ether-insoluble residue—Add 1 Gm. to 50 cc. of ether contained in a flask. Shake until no more dissolves, and then filter through a sintered glass crucible, which has been previously washed with ether, heated for 30 minutes at 50°, and weighed. Wash the crucible and contents with small portions of ether, using a total of 25 cc. Heat the crucible for 30 minutes at 50°, and weigh: the weight does not exceed 3 mg.

Reaction—A solution (1 in 20) is acid to litmus paper, but becomes neutral upon the addition of sodium chloride.

Metaphenylenediamine Hydrochloride, $C_6H_4(NH_2)_2.2HCl$—A white or slightly reddish white, crystalline powder, easily soluble in water. On exposure to light it acquires a reddish color.

Solubility—A solution of 1 Gm. in 200 cc. of water is colorless.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid: the weight of the residue does not exceed 1.0 mg. (0.10 per cent).

Keep protected from light.

Metaphosphoric Acid, HPO_3—White, deliquescent, glassy rods, freely but slowly soluble in cold water. It contains sodium phosphate to render the acid firm and capable of being molded.

Chloride—The chloride from 1 Gm. corresponds to not more than 0.03 mg. of Cl, page 729.

Nitrate—To a solution of 1 Gm. in 10 cc. of water, add 0.05 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid: the blue color persists for 10 minutes (about 0.003 per cent NO_3).

Sulfate—Dissolve 10 Gm. by heating with 100 cc. of water, add to the solution 4 cc. of hydrochloric acid, bring to a boil, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is formed, filter, wash well with hot water, and ignite: the weight of the barium sulfate so obtained is not more than 5 mg. (about 0.02 per cent SO_4).

Substances reducing permanganate—Mix 10 cc. of water with 5 cc. of diluted sulfuric acid, heat on a steam bath, then add tenth-normal potassium permanganate, previously diluted with 2 volumes of water, until a faint pink color persists. Now dissolve in this liquid 2 Gm. of the metaphosphoric acid, add 0.10 cc. of tenth-normal potassium permanganate, and heat on a steam bath: the pink color is not discharged in 5 minutes.

Heavy metals—Dissolve 1 Gm. in 15 cc. of water, add 3 drops of phenolphthalein T.S., neutralize with dilute ammonia T.S., then add 5 cc. of normal sulfuric acid and

5 cc. of hydrogen sulfide T.S.: any color produced in 1 minute is not darker than that produced by 0.02 mg. of Pb and 5 cc. of hydrogen sulfide T.S. in the same volume of solution as the sample (20 parts per million).

Iron—Dissolve 1 Gm. in 100 cc. of water. To 20 cc. of the solution add 10 cc. of hydrogen sulfide T.S., and make alkaline with ammonia T.S.: if a green color is produced, it is not darker than that of a blank to which 0.03 mg. of Fe has been added (150 parts per million).

Methanol, CH_3OH—A clear, colorless liquid, miscible with water, alcohol, and with ether; a characteristic odor; inflammable.

Assay—The specific gravity is not more than 0.791, corresponding to not less than 99.5 per cent by volume of CH_3OH.

Solubility in water—Mix 15 cc. with 45 cc. of water and allow to stand for 1 hour; the solution is as clear as an equal volume of the water.

Boiling range—Determine by method II, page 625: not less than 95 per cent distils between 64° and 67°.

Non-volatile—Evaporate 120 cc. on a water bath and dry the residue at 105° to 110° for 30 minutes: the weight of the residue does not exceed 1.0 mg. (0.001 per cent).

Acidity—Mix 10 cc. of methanol with 25 cc. of water, add 0.5 cc. of phenolphthalein T.S. and fiftieth-normal sodium hydroxide until a slight pink color is produced which persists after shaking for 30 seconds. Add 25 cc. of the methanol, mix well, and add fiftieth-normal sodium hydroxide to the production of a slight pink color: the second titration requires not more than 0.5 cc. of the sodium hydroxide.

Alkalinity—Dilute 25 cc. with 25 cc. of water and add 1 drop of methyl red T.S.: not more than 0.20 cc. of fiftieth-normal sulfuric acid should be required to produce a pink color (0.0003 per cent as NH_3).

Acetone, aldehydes—To 1 cc. of methanol add 4 cc. of water and 5 cc. of Nessler's reagent. Any resulting turbidity is not greater than that produced by 0.03 mg. of acetone in 5 cc. of water and 5 cc. of Nessler's reagent (0.003 per cent as acetone).

Ethyl alcohol—Dilute 5 cc. with 15 cc. of water, and add 5 cc. of normal sodium hydroxide. Add slowly, with stirring, 15 cc. of tenth-normal iodine and keep the mixture at about 40° for 30 minutes. The mixture is as free from turbidity or yellow color as a blank made with 20 cc. of water and the same quantities of sodium hydroxide and tenth-normal iodine as used in the test (about 1 per cent of C_2H_5OH).

Substances reducing permanganate—Cool 20 cc. to 15°, add 0.1 cc. of tenth-normal potassium permanganate, and allow to stand at 15° for 5 minutes: the pink color should not entirely disappear.

Substances darkened by sulfuric acid—Cool 10 cc. of reagent sulfuric acid in a small Erlenmeyer flask to 10° and add, drop by drop with constant agitation, 10 cc. of methanol. The resulting mixture should not have more than a slight, brown color.

Methylene Blue—Use *Methylene Blue*, page 324.

Methylene Chloride (*Dichloromethane*), CH_2Cl_2—A colorless liquid having an odor resembling that of chloroform. It is practically non-inflammable and is stable in air. It is soluble in about 50 parts of water; miscible with alcohol, acetone, chloroform, ether, and carbon tetrachloride. *Keep in tight containers.*

Specific gravity—Between 1.31 and 1.33.

Boiling range—Distil 100 cc. by method II, page 625: not less than 95 per cent distils between 38.5° and 40.5°.

Non-volatile—Evaporate 40 cc. and dry at 105° to 110° for 30 minutes: the weight of the residue does not exceed 1.0 mg. (0.002 per cent).

Acid—Shake 12 cc. with 25 cc. of water for 5 minutes, separate and reject the methylene chloride. To 10 cc. of the water layer add 2 drops of phenolphthalein T.S. and 0.05 cc. of tenth-normal sodium hydroxide: a pink color is produced.

Chloride ion—To another 10 cc. of the water layer obtained in the preceding test add 2 drops of nitric acid and 1 cc. of silver nitrate T.S.: any turbidity produced is not greater than is produced by 0.03 mg. of chloride ion in 10 cc. of water and the same quantities of nitric acid and silver nitrate used in the test (0.0005 per cent).

Free chlorine—Shake 10 cc. for 2 minutes with 10 cc. of water to which 2 drops of potassium iodide T.S. have been added, and allow to separate: the lower layer does not show any violet tint.

Iodine-consuming substances—To 15 cc. add 1 drop of tenth-normal iodine and shake well: the violet color remains at the end of 30 minutes.

Molybdic Acid—This reagent is commonly known as *Molybdic Acid 85 per cent.* It consists largely of an ammonium molybdate.

Assay—Weigh accurately about 500 mg., and dissolve it by heating with 50 cc. of water and 1 cc. of stronger ammonia T.S.; then proceed as described in the *Assay* under *Molybdenum Trioxide*, page 785, beginning with "add 5 cc. of acetic acid." Not less than 84 per cent MoO_3 should be found.

Insoluble in ammonium hydroxide—It conforms to the limit for *Insoluble in ammonia water* given under *Molybdenum Trioxide*, page 785.

Chloride—Test as described under *Molybdenum Trioxide*, page 785. The turbidity produced corresponds to not more than 0.05 mg. of chloride ion (0.005 per cent).

Phosphate—It conforms to the limit for *Phosphate* given under *Molybdenum Trioxide* (0.0005 per cent), page 785.

Sulfate—Test as described for *Molybdenum Trioxide*, page 785. The turbidity corresponds to not more than 0.4 mg. of SO_4 (0.2 per cent).

Molybdenum Trioxide (*Molybdic Anhydride*), MoO_3—A slightly yellowish powder. Slightly soluble in water, soluble in ammonia T.S. and in solutions of alkali hydroxides.

Assay—Weigh accurately about 500 mg. and dissolve with heat in a mixture of 50 cc. of water and 3 cc. of dilute ammonia T.S. Add 5 cc. of acetic acid, and dilute with water to about 200 cc. Heat to boiling, and add a clear solution of 1.5 Gm. of lead acetate in 20 cc. of water. Boil for several minutes, with stirring, until the precipitate becomes granular and settles readily. Decant the supernatant liquid through ignited asbestos in a Gooch crucible, wash the precipitate by decantation 10 times with 50-cc. portions of boiling water, then transfer the precipitate to the crucible, dry, ignite, and weigh as $PbMoO_4$. The weight of the lead molybdate, multiplied by 0.3922, represents the MoO_3, which corresponds to not less than 99.5 per cent.

Insoluble in ammonia water—Dissolve 10 Gm. by heating on a water bath with a mixture of 30 cc. of water and 20 cc. of stronger ammonia T.S., adding more stronger ammonia T.S., if necessary, to dissolve completely the molybdenum trioxide. Filter through asbestos in a Gooch crucible, wash, and dry at from 105° to 110°: the weight of the insoluble residue does not exceed 1.0 mg. (0.01 per cent). (Note—Reserve the filtrate, but not the washings, for the phosphate test.)

Chloride—Digest 1.5 Gm. with 20 cc. of water and 10 cc. of nitric acid for 15 minutes and filter. To 20 cc. of the filtrate add 1 cc. of silver nitrate T.S. Any re-

sulting turbidity is not greater than that produced by 0.02 mg. of chloride ion in an equal volume of solution made with the same quantities of the same reagents used in the test (0.002 per cent Cl).

Nitrate—Triturate 1 Gm. with 10 cc. of water containing 5 mg. of sodium chloride. Add 0.2 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid. The blue color is not completely discharged in 5 minutes (about 0.003 per cent NO_3).

Phosphate—Pour the filtrate (without the washings) obtained in the test for *Insoluble in ammonia water* into a mixture of 60 cc. of nitric acid and 60 cc. of water. Shake the mixture for 5 minutes at 40°, and allow to stand for 1 hour. Any precipitate should not be greater than that produced in a blank prepared by treating 2 Gm. of the molybdic anhydride and 0.04 mg. of phosphate (PO_4) with the same quantities of reagents and in the same manner as in the test (0.0005 per cent of PO_4).

Sulfate—Boil 1 Gm. with a mixture of 5 cc. of nitric acid and 10 cc. of water for 5 minutes. Cool, dilute to 50 cc., mix well, and filter. Evaporate 10 cc. of the filtrate to dryness on a water bath, moisten the residue with 3 drops of hydrochloric acid, add a few cc. of water, warm, dilute with water to 25 cc., and filter. The filtrate shows no more sulfate than corresponds to 0.04 mg. of SO_4 (0.02 per cent), page 729.

Ammonia—Dissolve 500 mg. in 10 cc. of 10 per cent solution of sodium hydroxide, dilute to 50 cc. with water, and add 3 cc. of Nessler's reagent. The color is not greater than that produced by 0.05 mg. of NH_3 (in the form of ammonium salt) in an equal volume of solution made with the same quantities of the same reagents used in the test (0.01 per cent of NH_3).

Heavy metals—Dissolve 1 Gm. in 15 cc. of 10 per cent solution of sodium hydroxide, add 2 cc. of ammonia T.S., and dilute to 50 cc. with water. To 10 cc. of the diluted solution add 3 cc. of hydrogen sulfide T.S. Any resulting brown color should not be greater than that produced in a blank by 0.01 mg. of Pb (50 parts per million).

N-(1-Naphthyl)-ethylenediamine Dihydrochloride, $C_{10}H_7HNCH_2CH_2NH_2\ 2HCl$ —White or slightly pinkish, crystalline powder. Soluble in water; slightly soluble in alcohol.

Sensitiveness—(*a*) Dissolve 10 mg. in 100 cc. of water, then dilute 2 cc. with water to 100 cc. (*b*) Dissolve 50 mg. of reagent sulfanilic acid in 4 cc. of glacial acetic acid, and dilute with water to 100 cc. (*c*) Dissolve 350 mg. of sodium nitrite in 10 cc. of water.

To 10 cc. of (*b*) add 0.2 cc. of (*c*), allow to stand for 5 minutes, then add 1 cc. of (*a*): a distinct pink color develops within 1 minute.

Clarity and completeness of solution—A solution of 100 mg. in 5 cc. of water is complete and clear or practically so.

Residue on ignition—Ignite 200 mg. with a few drops of sulfuric acid. No weighable residue remains.

β-Naphthylamine Acetate, $C_{10}H_7NH_2.HC_2H_3O_2$—White to yellowish white, crystalline scales or flakes. Very soluble in water and in alcohol; soluble in ether.

α-Naphthylamine—A solution (1 in 100) does not give a violet color with 5 drops of ferric chloride T.S.

α-Naphthylamine Hydrochloride, $C_{10}H_7NH_2.HCl$—A white, crystalline powder which turns bluish upon exposure to light and air. Soluble in water, in alcohol, and in ether.

A solution (1 in 100), made slightly acid with acetic acid, gives a violet color with

5 drops of ferric chloride T.S. A solution (1 in 40) in diluted acetic acid is colorless and not more than slightly opalescent.

Residue on ignition—Ignite 2 Gm.; the weight of the residue does not exceed 1.0 mg. (0.05 per cent).

Nitric Acid, HNO_3—A clear, colorless liquid. Specific gravity about 1.4.

Assay—Weigh accurately about 2 cc. in a tared, glass-stoppered flask. Dilute with 25 cc. of water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 63.02 mg. of HNO_3. It contains not less than 68 per cent and not more than 71 per cent of HNO_3.

Non-volatile—Evaporate 70 cc. of the acid to dryness in a platinum dish, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue does not exceed 0.5 mg. (0.0005 per cent).

Chloride—Dilute 5 cc. of the acid with an equal volume of water and add 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that produced by 0.005 mg. of chloride ion in 9 cc. of water to which are added 1 cc. of dilute nitric acid (1 volume of reagent nitric acid with 9 volumes of water) and 1 cc. of tenth-normal silver nitrate (0.00007 per cent Cl).

Sulfate—Add about 10 mg. of anhydrous sodium carbonate to 18 cc. of the acid and evaporate to dryness on a water bath. The residue, dissolved in 25 cc. of water, shows no more sulfate than corresponds to 0.05 mg. of SO_4 (0.0002 per cent), page 729.

Arsenic—Mix 70 cc. of the acid with 3 cc. of sulfuric acid, and evaporate until fumes of SO_3 are copiously evolved. Cool, cautiously dilute with 10 cc. of water, adding 10 cc. of sulfuric acid, re-evaporate to the evolution of fumes of SO_3 and then test for arsenic, page 618: the stain produced corresponds to not more than 0.004 mg. of As_2O_3 (0.04 parts per million).

Heavy metals—Evaporate 7 cc. (10 Gm.) to dryness on a steam bath. Warm the residue with 2 cc. of diluted acetic acid and 15 cc. of water and dilute to 30 cc. The heavy metals limit for nitric acid is 3 parts per million.

Iron—Evaporate 7 cc. (10 Gm.) to dryness on a steam bath. Add to the residue 2 cc. of hydrochloric acid, dilute with water to 20 cc. and add 2 cc. of ammonium thiocyanate T.S.: any red color produced corresponds to not more than 0.01 mg. of Fe (1 part per million).

Nitric Acid, Diluted (10 per cent HNO_3)—Dilute 105 cc. of nitric acid with sufficient water to make 1000 cc.

Nitric Acid, Fuming—A yellowish red to brownish red, fuming liquid.

Specific gravity—About 1.50.

It conforms to the tests for purity under *Nitric Acid*, page 787.

Nitrobenzene, $C_6H_5NO_2$—An almost colorless to pale yellow liquid of characteristic odor. Almost insoluble in water; miscible with alcohol, benzene, or ether. Specific gravity about 1.2.

Boiling range—Not less than 95 per cent distils between 210° and 212°.

Congealing temperature—The freezing temperature is not below 5°.

Acid—Shake 8 cc. (10 Gm.) with 25 cc. of water for 1 minute and allow the liquids to separate. To the water layer separated from the Nitrobenzene add 2 drops of

bromophenol blue. The yellow color of the liquid is changed to bluish violet by not more than 0.5 cc. of fiftieth-normal sodium hydroxide.

Orange G (The sodium salt of azo-benzene-beta-naphthol disulfonic acid), $C_6H_5.N{:}N.C_{10}H_4(OH)(SO_3Na)_2$ (2,6,8)—Orange to brick red powder or dark red crystals; readily soluble in water, yielding an orange yellow solution, slightly soluble in alcohol, insoluble in ether or chloroform. The addition of tannic acid T.S. to a solution of orange G (1 in 500) causes no precipitation (*acid color*). The addition of hydrochloric acid to a mixture of 500 mg. of zinc dust and 10 cc. of a solution of the color (1 in 500) produces decolorization. When filtered, the colorless filtrate, on standing exposed to the air, does not regain its original color (*presence of azo-group*). When heated, orange G does not deflagrate (distinction from *nitro colors*). The addition of barium or calcium chloride T.S. to a concentrated solution of orange G produces a colored, crystalline precipitate. The addition of hydrochloric acid to a solution of the dye (1 in 500) produces no change; the addition of sodium hydroxide T.S. to a similar solution produces a yellowish red to a bordeaux color but no precipitation. Orange G dissolves in sulfuric acid with an orange to yellowish red color; no change in color results upon diluting the solution cautiously with water.

Ortho-phenanthroline, $C_{12}H_8N_2.H_2O$—White or grayish white, odorless crystals or crystalline powder. Melts between 93° and 95°. Sparingly soluble in water; soluble in alcohol and in acetone.

Residue on ignition—Ignite 100 mg.: the residue is negligible.

Sensitiveness—Dissolve 150 mg. of ortho-phenanthroline in 10 cc. of a solution of ferrous sulfate, prepared by dissolving 1.48 Gm. of clear crystals of ferrous sulfate in 100 cc. of water. The ferrous sulfate solution must be prepared immediately before dissolving the ortho-phenanthroline in it. Add 0.1 cc. of this solution to 100 cc. of oxygen-free water previously mixed with 5 cc. of diluted sulfuric acid, then add 0.05 cc. of tenth-normal ceric sulfate. The red color of the solution should change to pale blue.

Oxalic Acid, $H_2C_2O_4.2H_2O$—White crystals, soluble in water, very soluble in boiling water and in alcohol; slightly soluble in ether.

Insoluble—Dissolve 10 Gm. in 200 cc. of hot water: the weight of the insoluble residue does not exceed 1.0 mg. (0.01 per cent), page 729.

Residue on ignition—Ignite 5 Gm.: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Chloride—Dissolve 5 Gm. in 75 cc. of water, add 15 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any resulting turbidity is not greater than that produced by 0.1 mg. of chloride ion in an equal volume of solution made with the same quantities of the same reagents used in the test (0.002 per cent).

Nitrogen compounds—Dissolve 2 Gm. in 20 cc. of water in a flask, add 40 cc. of 10 per cent solution of sodium hydroxide, cooling with ice while adding the sodium hydroxide. Add about 500 mg. of aluminum wire or foil in small pieces, protect from the absorption of ammonia by covering the flask or closing it with a stopper carrying a long thin tube, and allow it to stand for about 4 hours, agitating it occasionally. Dilute with water to 100 cc., decant 50 cc. of the clear liquid, and add 2 cc. of Nessler's reagent: any resulting color is not greater than that produced by the same treatment

of a quantity of an ammonium salt corresponding to 0.02 mg. of nitrogen (0.001 per cent as N).

Sulfate—Dissolve 2 Gm. in 20 cc. of warm water, add ammonia T.S. to a slight alkaline reaction, and add about 1 Gm. of anhydrous sodium carbonate. Evaporate to dryness in a porcelain dish and gently ignite the residue with a sulfur-free flame until no more fumes are evolved. Cool, add 10 cc. of water and 1 cc. of bromine T.S., and heat on a steam bath for 15 minutes. Add 3 cc. of hydrochloric acid and evaporate to dryness on the bath. The residue, dissolved in 25 cc. of water, shows no more sulfate than a blank to which 0.10 mg. of SO_4 has been added (0.005 per cent).

Heavy metals—To the residue from the test for *residue on ignition* add 1 cc. of hydrochloric acid and 5 drops of nitric acid, evaporate to dryness on a steam bath, and dissolve the residue in 25 cc. of water. Use 10 cc. of the solution for testing for heavy metals. The heavy metals limit, page 730, for oxalic acid is 10 parts per million.

Iron—Dilute 10 cc. of the solution from the preceding test to 25 cc. with water, add 2 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S.: any red color produced is not darker than that produced by 0.010 mg. of Fe (5 parts per million).

Substances darkened by hot sulfuric acid—Heat 1 Gm. of the oxalic acid with 10 cc. of reagent sulfuric acid in a previously ignited test tube until fumes of SO_3 are evolved. At most, only a faint coloration should be produced.

Palladous Chloride, $PdCl_2$—Dark brown, hygroscopic powder. Its solution is turbid due to the formation of a basic salt, but dissolves clearly on the addition of hydrochloric acid.

Assay—Weigh accurately about 200 mg. of palladous chloride, dissolve it, by warming, in 5 cc. of diluted hydrochloric acid and dilute to 200 cc. with water. Add to the solution 50 cc. of an alcohol solution of dimethylglyoxime (1 Gm. in 100 cc.) and heat on a water bath for 1 hour. Filter while warm, wash the residue with warm water, and ignite: the weight of the palladium metal thus obtained corresponds to not less than 59 per cent of the weight of the palladous chloride taken for the assay.

Pancreatic Digest of Casein (a bacteriological peptone)—A grayish yellow powder with a characteristic, but not putrescent, odor. It is freely soluble in water, but insoluble in alcohol and in ether. The casein used in preparation of this Digest meets the following specifications:

Ash	not more than 2.5 per cent
Loss on drying	not more than 8 per cent
Free acid (as lactic acid)	not more than 0.25 per cent
Fat	not more than 0.5 per cent
Reducing sugars	not more than trace
Fineness	All passes through a 20 mesh sieve

Degree of digestion—Dissolve 1 Gm. of the Digest in 10 cc. of water.

(*a*) Overlay 1 cc. of the digest solution with 0.5 cc. of a solution of 1 cc. of glacial acetic acid in 10 cc. of diluted alcohol: no ring or precipitate forms at the junction of the two liquids, and when shaken no turbidity results, indicating the absence of undigested casein.

(*b*) Mix 1 cc. of the digest solution with 4 cc. of a saturated solution of zinc

sulfate. A moderate amount of precipitate is formed, indicating the presence of proteoses.

(c) To 1 cc. of the filtrate from (b) add 3 cc. of water and follow with 4 drops of bromine T.S. A violet-red color is produced.

Nitrogen content—Determine the nitrogen content of the Digest, previously dried to constant weight at 100° by the Kjeldahl method, page 671. Not less than 10 per cent of nitrogen (N) is found.

Loss on drying—Weigh accurately about 1 Gm. of the Digest and dry to constant weight at 100°. The loss in weight corresponds to not more than 7 per cent.

Residue on ignition—Weigh accurately about 500 mg. of the Digest and heat slowly until thoroughly charred. Cool, add 1 cc. of sulfuric acid, and ignite to constant weight. The weight of the residue corresponds to not more than 15 per cent.

Nitrite—To 5 cc. of a solution of the Digest (1 in 50) add 0.5 cc. of sulfanilic-α-naphthylamine T.S., mix, and allow to stand for 15 minutes: no pink or red color develops.

Bacteriologic test—The Digest meets the following tests for bacteria-nutrient properties. Prepare media of the following compositions:

(a) 2 per cent of peptone, 0.5 per cent of sodium chloride, in water;
(b) 1 per cent of peptone, 0.5 per cent of sodium chloride, in water;
(c) 0.1 per cent of peptone, 0.5 per cent of sodium chloride, in water;
(d) 1 per cent of peptone, 0.5 per cent of sodium chloride, 0.5 per cent of dextrose, in water;
(e) 2 per cent of peptone, 0.5 per cent of sodium chloride, 1.5 per cent of agar, in water.

Adjust all media to a pH of 7.2–7.4.

Freedom from fermentable carbohydrate—To medium (a) add sufficient phenolsulfonphthalein T.S. to give a readable color, tube in Durham fermentation tubes, and autoclave. Inoculate with a loop of 24 hour culture of *Escherichia coli*. No acid, or only a trace in the inner tube, and no gas are produced during incubation for 48 hours.

Production of indol—Inoculate 5 cc. of medium (c), with *Escherichia coli*, incubate for 24 hours, and test by the addition of about 0.5 cc. of dimethylamino-benzaldehyde T.S.: it shows a distinct pink or red color which is soluble in chloroform.

Production of acetylmethylcarbinol—Inoculate 5 cc. of medium (d) with *Ærobacter ærogenes*, and incubate for 24 hours. Test by adding to the culture an equal volume of 10 per cent solution of sodium hydroxide, shake and allow to stand at room temperature for several hours. The appearance of a pink color indicates the presence of acetylmethylcarbinol.

Production of hydrogen sulfide—Inoculate 5 cc. of medium (b) with *Eberthella typhosa.* Hold a strip or loop of lead acetate paper between the cotton plug and the mouth of the test tube so that it hangs about 2 inches above the medium. After incubation for 24 hours, the lower tip of the lead acetate paper shows little if any darkening; after 48 hours, it shows an appreciable amount of brownish blackening (*lead sulfide*).

Growth supporting properties—In the above tests the media support good growth of *Escherichia coli*, *Ærobacter ærogenes*, and *Eberthella typhosa*. Medium (e), stab-inoculated with a stock culture of *Brucella abortus*, shows good growth in the line

of the stab after incubation for 48 hours. Slants of medium (*e*), inoculated with *Escherichia coli*, *Ærobacter ærogenes*, *Eberthella typhosa*, *Pseudomonas æruginosa*, *Staphylococcus aureus*, and *Staphylococcus albus*, show characteristic growth after incubation for 24 hours. Medium (*e*), to which about 5 per cent of rabbit blood has been added, inoculated, and poured into Petri dishes, shows characteristic alpha or beta zones about colonies of *pneumococci* and *beta hemolytic streptococci* (serological groups A and B), recognizable within 24 hours and fully developed after 48 hours' incubation. Medium (*e*), to which about 10 per cent of blood has been added, then heated to 80° to 90° until the blood turns chocolate brown, permits the growth of *gonococcus* colonies within 48 hours when incubated in an atmosphere containing about 10 per cent of carbon dioxide.

Paraffin—A colorless or white, more or less transparent mass, frequently showing a crystalline structure. It is insoluble in water, slightly soluble in alcohol, freely soluble in benzene, chloroform, ether, carbon disulfide, and in petroleum benzin. Its specific gravity is about 0.90, and it melts between 50° and 65°.

Acid—Shake about 10 Gm. of paraffin with an equal volume of hot alcohol: the separated alcohol does not redden moistened blue litmus paper.

Readily carbonizable substances Place 5 cc. of paraffin, liquefied by heating at a temperature just above its melting point, in a glass-stoppered cylinder, which has been previously rinsed with sulfuric acid, and heat at 65° for 10 minutes. Add 5 cc. of sulfuric acid, and shake the mixture vigorously for a few seconds at intervals of 1 minute during a 10-minute period. The paraffin remains unchanged in color, and the acid layer does not become darker than pale amber.

Pepsin—*Use Pepsin*, N. F. VIII.

Peptone, Dried (*Meat Peptone*)—A reddish yellow to brown powder, with characteristic, but not putrescent, odor. It is soluble in water, forming a yellowish brown solution having a slight acid reaction. It is insoluble in alcohol and in ether.

Nitrogen content—Determine the nitrogen content by the Kjeldahl method, page 671, in the peptone previously dried to constant weight at 100°. It shows not less than 14.2 per cent and not more than 15.5 per cent of nitrogen (N), corresponding to a minimum of 89 per cent protein.

Residue on ignition—Weigh accurately about 500 mg. and heat slowly until it is thoroughly charred. Cool, add 1 cc. of sulfuric acid, and ignite to constant weight: the weight of the residue corresponds to not more than 5 per cent of the peptone taken for the test.

Loss at 100°—Weigh accurately about 1 Gm. of peptone and dry to constant weight at 100°: the loss in weight corresponds to not more than 7 per cent of the original peptone

Coagulable protein—Upon heating a filtered solution (1 in 20) to boiling, no precipitate forms.

Proteoses—Mix 5 cc. of a filtered solution (1 in 10) with 20 cc. of a filtered solution of zinc sulfate (made by dissolving 50 Gm. of the salt in 35 cc. of water): not more than a slight, flocculent precipitate is formed.

Perchloric Acid, $HClO_4$—A colorless, clear liquid. Miscible with water. It is very caustic and may deflagrate on contact with oxidizable substances.

Assay—Weigh about 3 cc. of the acid, dilute with 50 cc. of water, and titrate with normal sodium hydroxide, using phenolphthalein T.S. as indicator. Each cc. is equivalent to 100.5 mg. It shows not less than 70 per cent of $HClO_4$.

Non-volatile—Evaporate 12 cc. of the acid and ignite. The weight of the residue does not exceed 1 mg. (about 0.005 per cent).

Chloride—The chloride in 5 cc. of the acid corresponds to not more than 0.08 mg. of Cl (0.001 per cent), page 729.

Nitrogen compounds—Dilute 1 cc. of the acid with 40 cc. of water in a Kjeldahl distilling flask. Add 15 cc. of 10 per cent sodium hydroxide solution and 1 Gm. of powdered Devarda's metal. Allow to stand for 1 hour, then distil 30 cc. into 5 cc. of water containing 1 drop of hydrochloric acid. Dilute the distillate with water to 50 cc., add 2 cc. of 30 per cent sodium hydroxide and 2 cc. of Nessler's reagent. The color is not darker than that produced by treating 0.045 mg. of nitrogen (as NH_4Cl) in the same manner (0.003 per cent as N).

Sulfate—Dilute 2 cc. of the acid with 20 cc. of water, neutralize with ammonia T.S., add 0.3 cc. of hydrochloric acid, and dilute with water to 30 cc., then add 3 cc. of barium chloride T.S. If a turbidity is produced, it corresponds to not more than 0.15 mg. of SO_4 (0.005 per cent), page 729.

Heavy metals—Mix 2.0 cc. of the acid with 30 cc. of water, neutralize with ammonia T.S., using litmus paper as indicator, then add 1 drop of the acid and 5 cc. of hydrogen sulfide T.S.: no brown color is produced.

Phenol—Use *Phenol*, page 404.

Phenylhydrazine, $C_6H_5.NH.NH_2$—Colorless, or slightly yellowish, highly refractive liquid.

Congealing temperature—Not below 16°, page 629.

Insoluble—Shake 1 cc. with 20 cc. of diluted acetic acid: the resulting solution is clear or practically so.

Non-volatile—Ignite 1 cc. with 0.5 cc. of sulfuric acid: the weight of the residue is not more than 1.0 mg. (0.1 per cent).

Phloroglucinol, $C_6H_3(OH)_3.2H_2O$—White or yellowish white crystals or a crystalline powder. Slightly soluble in water, soluble in alcohol and in ether.

Insoluble in alcohol—Dissolve 1 Gm. in 20 cc. of alcohol: a clear and complete solution results.

Melting range—Phloroglucinol melts between 215° and 219°, the bath being preheated to about 200°.

Residue on ignition—Ignite 1 Gm. with 0.5 cc. of sulfuric acid: not more than 1.0 mg. of residue remains (0.10 per cent).

Diresorcinol—Heat to boiling a solution of 100 mg. of phloroglucinol in 10 cc. of acetic anhydride, cool the solution and superimpose it upon 10 cc. of sulfuric acid: no violet color should appear at the zone of contact of the liquids.

Phosphomolybdic Acid, approximately $20MoO_3.2H_3PO_4.48H_2O$—Bright yellow crystals or crystalline powder; freely soluble in water.

Insoluble—The insoluble matter from 5 Gm. is not more than 1 mg. (0.02 per cent), page 729.

Chloride—To a solution of 1 Gm. in 50 cc. of water add 1 cc. of nitric acid, filter

and divide the filtrate into two equal portions. To one portion add 0.5 cc. of silver nitrate T.S., allow to stand for 10 minutes, filter until clear and add to the filtrate a volume of standard sodium chloride solution, page 729, equivalent to 0.1 mg. of Cl. To the other portion add 0.5 cc. of silver nitrate T.S.: the turbidity in this portion is not greater than in the first (0.02 per cent).

Nitrate—Dissolve 200 mg. in 10 cc. of water, add 0.1 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid: the blue color persists for 5 minutes.

Sulfate—To a solution of 200 mg. in 20 cc. of water add 0.5 cc. of diluted hydrochloric acid and 2 cc. of barium chloride T.S.: no turbidity is produced in 1 minute.

Ammonia—To a solution of 500 mg. in 5 cc. of water add 10 cc. of 10 per cent sodium hydroxide solution and heat the mixture on a steam bath: the odor of ammonia is not evolved.

Calcium—Dissolve 500 mg. in 10 cc. of hot water, make the solution alkaline with ammonia T.S., then add 1 cc. of ammonium oxalate T.S.: no turbidity is produced in 10 seconds.

Phosphoric Acid, H_3PO_4—A colorless, odorless liquid of a syrupy consistence; miscible with water and with alcohol.

Assay—Weigh accurately about 1 Gm. in a tared, glass-stoppered flask. Then add about 25 cc. of water, and dissolve 5 Gm. of sodium chloride in the solution. Titrate the solution with normal sodium hydroxide, using 2 drops of phenolphthalein T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 49.00 mg. of H_3PO_4. It contains not less than 85 per cent and not more than 88 per cent of H_3PO_4.

Dilute with 14 volumes of water and apply the tests which follow, for nitrate, phosphorous or hypophosphorous acid, sulfate, and arsenic.

Nitrate—Mix 5 cc. of the dilution with about 0.1 cc. of indigo carmine T.S., then add 5 cc. of sulfuric acid: the blue color should not be discharged in 1 minute.

Phosphorous or hypophosphorous acid—Warm 5 cc. of the dilution gently, and add 2 cc. of silver nitrate T.S.: the mixture does not become brown.

Sulfate—Mix 1 cc. of the dilution with 6 cc. of water, and add 1 cc. of barium chloride T.S.: no precipitate is produced immediately.

Arsenic—A 2-cc. portion of the dilution meets the requirements of the test for arsenic, page 618.

Alkali and other phosphates—Transfer 1 cc. to a graduated cylinder, and add 6 cc. of ether and 2 cc. of alcohol: no turbidity appears.

Heavy metals—Dilute 3 cc. (5 Gm.) with water to make 50 cc. Mix 10 cc. of this dilution with 5.5 cc. of sodium hydroxide T.S., and add water to make 25 cc.: the heavy metals limit, page 730, for phosphoric acid is 20 parts per million.

Phosphorus Pentoxide (*Phosphoric Anhydride*), P_2O_5—A white, amorphous powder; very rapidly deliquescent. Soluble in water with evolution of heat, forming phosphoric acid; also soluble in alcohol. Keep in tightly closed containers.

Caution—When a solution is being made, the phosphorus pentoxide must be added to the water in small portions to prevent excessive spattering.

Assay—Weigh accurately in a glass-stoppered weighing bottle about 2 Gm. and transfer it with the aid of cold water to a 300-cc. Erlenmeyer flask. Dilute with 100 cc. of water and boil until the volume is reduced to about 25 cc. Cool, add 2 drops of methyl orange T.S., and titrate with normal sodium hydroxide. Each cc. of

normal sodium hydroxide is the equivalent of 70.98 mg. of P_2O_5. The assay indicates not less than 97 per cent of P_2O_5.

Phosphorus trioxide—Dissolve 5 Gm. in 50 cc. of water, add 0.5 cc. of tenth-normal potassium permanganate, and heat for 5 minutes on a steam bath. The pink color does not entirely disappear.

Phosphotungstic Acid, approximately $P_2O_5.24WO_3.xH_2O$—White or yellowish green crystals or a crystalline powder. Soluble in water, in alcohol, and in ether.

Insoluble—The insoluble matter from 5 Gm. is not more than 1.0 mg. (0.02 per cent), page 729.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.3 mg. of Cl (0.03 per cent), page 729.

Nitrate—Dissolve 500 mg. in 10 cc. of water, add about 10 mg. of sodium chloride, 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid. The blue color should not disappear within 1 minute (about 0.01 per cent NO_3).

Sulfate—The sulfate in 500 mg. corresponds to not more than 0.1 mg. of SO_4 (0.02 per cent), page 729.

Ammonia—Dissolve 500 mg. in 10 cc. of water, add 5 cc. of 20 per cent solution of sodium hydroxide, and heat on a water bath: the escaping vapor should not turn moistened red litmus paper blue (about 0.02 per cent NH_3).

Heavy metals and iron—Dissolve 500 mg. in 10 cc. of water. Add ammonia T.S., drop by drop, until the precipitate which forms is just dissolved. Then add 5 drops of ammonia T.S. in excess and 5 cc. of hydrogen sulfide T.S.: no brown or green color is produced in 1 minute.

Picric Acid—Use *Trinitrophenol*, page 830.

Picrolonic Acid (*1-p-Nitrophenyl-3-methyl-4-nitropyrazolone*), $C_{10}H_8N_4O_5$—Yellow to brownish yellow, crystalline powder. Slightly soluble in water, soluble in alcohol, chloroform, ether, benzene, and in solutions of alkali hydroxides.

Melting range—Between 110° and 117°; the greater the purity, the higher the melting temperature.

Residue on ignition (sulfated)—Not more than 0.1 per cent.

Sensitiveness—Dissolve 25 mg. of picrolonic acid in 10 cc. of warm water containing 0.1 cc. of glacial acetic acid, and filter the solution if necessary. Dissolve 100 mg. of calcium chloride in 250 cc. of water and mix well. Heat 1 cc. of the calcium chloride solution in a test tube to about 60°, then add to it 1 cc. of the picrolonic acid solution: a bulky precipitate forms in 5 minutes or less.

Platinic Chloride (*Chloroplatinic Acid*), $H_2PtCl_6.6H_2O$—Brownish red, deliquescent crystals or crystalline masses. Very soluble in water, soluble in alcohol and in ether.

Assay—Dissolve about 500 mg., accurately weighed, in 50 cc. of water. Add 15 cc. of 20 per cent solution of sodium hydroxide and 2 Gm. of chloral hydrate. Heat the mixture on a water bath until all of the platinum is precipitated. Keep the liquid strongly alkaline, adding more chloral hydrate, if necessary, to complete the precipitation. Filter, wash with hot water until the washings are nearly free of chloride, then wash with warm, 2 per cent acetic acid solution until the washings cease to give a reaction for chloride, ignite, and weigh: the weight corresponds to not less than 37 per cent of the platinic chloride taken.

Insoluble—Dissolve 1 Gm. in 10 cc. of water: the solution is clear and of yellow color, but not red or brown. One-half Gm. also dissolves in 5 cc. of alcohol to form a clear solution.

Nitrate—Mix 2 cc. of the solution obtained in the preceding test with 2 cc. of sulfuric acid and superimpose the cooled mixture upon 2 cc. of ferrous sulfate T.S. No brownish red color forms at the zone of contact of the liquids within 5 minutes (about 0.1 per cent NO_3).

Sulfate—Dilute 5 cc. of the solution obtained in the test for *Insoluble matter* with 5 cc. of water and add 1 cc. of barium chloride T.S.: no turbidity or precipitate is produced within 5 minutes (about 0.05 per cent SO_4).

Metals soluble in nitric acid—Ignite strongly 1 Gm. to volatilize all of the chlorine. Add to the residue 5 cc. of dilute nitric acid (1 in 3) and heat on a water bath for 15 minutes. Add 10 cc. of water, filter, and wash the residual platinum with 5 cc. of hot water. Evaporate the filtrate and washings to dryness and ignite to constant weight: the weight of the residue does not exceed 2.5 mg. (0.25 per cent).

Potassium and Sodium Tartrate, $KNaC_4H_4O_6.4H_2O$—Use *Potassium Sodium Tartrate,* page 429.

Potassium Acetate, $KC_2H_3O_2$—Use *Potassium Acetate,* page 419.

Potassium Bicarbonate, $KHCO_3$—Use *Potassium Bicarbonate,* page 421.

Potassium Biphosphate (*Monopotassium Phosphate, Monobasic Potassium Phosphate*), KH_2PO_4—Colorless or white crystals, soluble in water; insoluble in alcohol.

Insoluble, calcium and ammonium hydroxide precipitate—Dissolve 10 Gm. in 100 cc. of water, add 5 cc. of ammonium oxalate T.S., 15 cc. of ammonia T.S. and allow to stand over night. If a precipitate is formed, filter, wash, and ignite. The weight of the ignited precipitate does not exceed 1.0 mg. (0.01 per cent).

Loss on drying over sulfuric acid—Weigh accurately about 2 Gm. and dry for 24 hours over sulfuric acid: the loss in weight does not exceed 0.2 per cent.

Loss on ignition—Ignite carefully to constant weight the dried residue obtained in the preceding test: the loss in weight is not less than 13.15 per cent and not more than 13.35 per cent.

Hydrogen-ion concentration—Prepare a fifth-molar solution and determine the pH by the use of indicators or electrometrically. The pH should lie between 4.4 and 4.7. Take 10-cc. portions of the solution in four test tubes, and to each of two add 5 drops of a 0.04 per cent solution of bromophenol blue. To each of the other two add 5 drops of a 0.02 per cent solution of methyl red. To one tube with the bromophenol blue add 0.05 cc. of tenth-normal hydrochloric acid and to one of the tubes with methyl red add 0.05 cc. of tenth-normal sodium hydroxide. The solutions in the tubes to which acid and alkali are added should show distinct changes of color when compared with the corresponding tubes without either acid or alkali.

Chloride—The chloride from 2 Gm. corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 729.

Nitrogen compounds—Determine as directed under *Oxalic Acid,* page 788, using 20 cc. of 10 per cent sodium hydroxide solution: the color should not be greater than that produced in a control test with a quantity of an ammonium salt corresponding to 0.01 mg. of nitrogen (0.001 per cent N).

Sulfate—Dissolve 10 Gm. in 100 cc. of water, add 1 cc. of hydrochloric acid, and heat to boiling. Add 5 cc. of barium chloride T.S. and allow to stand over night: no precipitate is formed.

Heavy metals—Dissolve 2.5 Gm. in 20 cc. of water and exactly neutralize with ammonia T.S., using 2 drops of phenolphthalein T.S. Add 20 cc. of normal sulfuric acid, 5 cc. of hydrogen sulfide T.S. and dilute to 50 cc. Any brown color which is immediately developed should not be greater than that produced by 0.025 mg. of Pb in an equal volume of a solution treated with the same quantity of hydrogen sulfide T.S. (10 parts per million).

Iron—Dissolve 1 Gm. in 40 cc. of water, and add 2 cc. of stronger ammonia T.S. and 5 cc. of a freshly prepared hydrogen sulfide T.S. Any color produced should not be more than that produced by 0.020 mg. of iron in a solution of the same volume and with the same quantities of the same reagents used in the test (20 parts per million).

Sodium—A 10 per cent solution, tested with a platinum wire in a flame, imparts no distinct yellow color to the flame.

Potassium Biphthalate (*Acid Potassium Phthalate*), $KHC_6H_4(COO)_2$—Colorless crystals, or a white, crystalline powder. Soluble in water, slightly soluble in alcohol.

Assay—Dry about 600 mg. at 120° for 2 hours, cool in a desiccator over fresh sulfuric acid, and weigh accurately. Then transfer it completely with the aid of carbon dioxide-free water into a 300-cc. flask which has been swept free from carbon dioxide. Add sufficient carbon dioxide-free water to make the total volume about 50 cc. Stopper the flask and agitate the liquid until the potassium biphthalate is dissolved. Then add 3 drops of phenolphthalein T.S. and titrate with tenth-normal sodium hydroxide, free from carbonate.

Determine the quantity of sodium hydroxide required to produce the end-point by matching the color in another flask containing 3 drops of the same indicator and the same volume of solution, free from carbon dioxide. Subtract the volume required in the blank test from that used in the first titration and calculate on the basis that each cc. of tenth-normal sodium hydroxide corresponds to 20.42 mg. of $KHC_6H_4(COO)_2$. It shows not less than 99.9 per cent and not more than 100.2 per cent of $KHC_6H_4(COO)_2$.

Insoluble—The insoluble from 10 Gm. is not more than 0.5 mg., page 729.

Loss at 100°—Crush quickly a few Gm. of potassium biphthalate and heat about 2 Gm., accurately weighed, at 100° for 3 hours: the loss in weight does not exceed 0.05 per cent.

Chlorine compounds—Mix 500 mg. with 250 mg. of anhydrous sodium carbonate, moisten the mixture and ignite until thoroughly charred, avoiding an unduly high temperature. Treat with 15 cc. of water and cautiously add 1 cc. of nitric acid. Filter, wash the residue with a few cc. of hot water, add sufficient water to make 25 cc. and then 1 cc. of silver nitrate T.S.: the turbidity produced is not greater than in a blank to which 0.015 mg. of Cl has been added (0.003 per cent), page 729.

Sulfur compounds—Mix 2 Gm. with 1 Gm. of anhydrous sodium carbonate and dissolve it in water. Evaporate to dryness and char thoroughly with a flame free from sulfur. Treat the residue with 25 cc. of water, add a few cc. of bromine T.S., and heat on a water bath for 15 minutes. Neutralize with hydrochloric acid, adding a slight excess of acid, boil gently to expel the bromine, filter, wash with water to

make 25 cc., and add 2 cc. of barium chloride T.S.: any turbidity produced in 10 minutes is not greater than in a blank to which 0.12 mg. of SO_4 has been added (0.002 per cent as sulfur).

Heavy metals—Dissolve 3.5 Gm. in 30 cc. of hot water and neutralize the solution to litmus paper with dilute ammonia T.S. Dissolve in the solution 500 mg. more of the potassium biphthalate and dilute with water to 40 cc. To 10 cc. of the solution add a volume of standard lead solution, page 657, equivalent to 0.02 mg. of Pb, and dilute with water to 30 cc. (Solution A). Then add to this solution and to the remaining 30 cc. of the solution (B) 10 cc. each of hydrogen sulfide T.S.: B is no darker than A (10 parts per million).

Iron—Add to A a volume of standard solution of ferric ammonium sulfate, page 730, equivalent to 0.02 mg. of Fe, then make A and B alkaline with ammonia T.S.: B is no darker than A (10 parts per million).

Potassium Bisulfate, $KHSO_4$ (*for identification of glycerin*)—Fused, white, deliquescent masses or granules. Very soluble in water, to which it imparts an acid reaction to litmus. When heated, it evolves SO_3 and H_2O, changing to normal potassium sulfate.

Acidity—Dissolve 4 Gm., accurately weighed, in 50 cc. of water and titrate with normal alkali, using phenolphthalein T.S. as the indicator. It contains not less than 35.0 per cent and not more than 37.0 per cent, calculated as H_2SO_4.

Potassium Bromate, $KBrO_3$—White crystals or a granular powder. Soluble in water, slightly soluble in alcohol.

Assay—Dry about 300 mg. over sulfuric acid to constant weight. Weigh accurately about 100 mg. of the dried salt, dissolve it in 50 cc. of water, and add 3 Gm. of potassium iodide, followed by 3 cc. of hydrochloric acid. Allow to stand 5 minutes, add 100 cc. of cold water, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Correct for a blank, made with the same quantities of the same reagents. Each cc. of tenth-normal sodium thiosulfate is equivalent to 2.784 mg. of $KBrO_3$. Not less than 99.8 per cent of $KBrO_3$ is found.

Insoluble—The insoluble matter from 10 Gm. dissolved in 150 cc. of hot water weighs not more than 1.0 mg. (0.01 per cent).

Neutrality—To a solution of 5 Gm. in 60 cc. of warm water add 3 drops of phenolphthalein T.S.; no pink color is produced. Add 0.2 cc. of fiftieth-normal sodium hydroxide: a pink color is produced.

Bromide—Dissolve 4 Gm. in 80 cc. of water and divide the solution into two equal portions. Add 5 drops of normal sulfuric acid to one portion. At the end of 2 minutes this solution should not be more yellow than the portion to which no acid was added (about 0.05 per cent of Br).

Nitrogen compounds—Dissolve 2 Gm. in 40 cc. of water and add 10 cc. of a 10 per cent solution of sodium hydroxide and about 500 mg. of aluminum wire or foil in small pieces. Allow to stand for 3 hours protected from loss or access of ammonia. To one-half of the clear liquid add 2 cc. of Nessler's reagent. The color is not greater than that produced by the treatment of a quantity of an ammonium salt, corresponding to 0.02 mg. of nitrogen (0.001 per cent N).

Sulfate—Evaporate 2 Gm. to dryness with 10 cc. of hydrochloric acid and repeat the evaporation with 5 cc. of the acid: the residue, dissolved in 25 cc. of water shows,

no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 729.

Heavy metals—Evaporate 2 Gm. with 10 cc. of hydrochloric acid to dryness on a steam bath, and repeat the evaporation with 5 cc. of hydrochloric acid. Test the residue for heavy metals as described in the test for *Heavy metals in reagents*, page 730. The heavy metals limit for potassium bromate is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.04 mg. of Fe (0.002 per cent), page 730.

Sodium—Test a warm 10 per cent solution in the flame with a platinum wire: no pronounced yellow color should be produced (about 0.02 per cent Na).

Potassium Bromide, KBr—Use *Potassium Bromide*, page 421.

Potassium Carbonate, $K_2CO_3.xH_2O$—Use *Potassium Carbonate*, page 422.

Potassium Carbonate, Anhydrous, K_2CO_3—White granules or powder, very hygroscopic. Very soluble in water with the evolution of heat.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Loss on ignition—Ignite about 2 Gm., accurately weighed, at from 200° to 250°: the loss in weight corresponds to not more than 1 per cent.

Chloride and chlorate—Ignite 1 Gm. at a low red heat in a platinum dish. Cool, dissolve in 25 cc. of water, add 3 cc. of nitric acid, and filter if necessary: the solution shows no more chloride than corresponds to 0.03 mg. of Cl (0.003 per cent as Cl), page 729.

Nitrogen compounds—Determine as directed under *Oxalic Acid*, page 788, using 10 cc. of 10 per cent sodium hydroxide solution: the color produced is not greater than is produced by the same treatment of a quantity of an ammonium salt corresponding to 0.02 mg. of nitrogen (0.001 per cent N).

Phosphate—Dissolve 5 Gm. in 50 cc. of water and add 15 cc. of nitric acid (in small portions). Nearly neutralize with ammonia T.S., add 50 cc. of ammonium molybdate T.S., shake the mixture at about 40° for 5 minutes, and allow to stand for 1 hour. Any yellow precipitate produced is not greater than is formed from 0.25 mg. of PO_4 in an equal volume of solution containing as nearly as possible the same quantities of the same nitric acid, ammonia T.S., and ammonium molybdate T.S. used in the test (0.005 per cent PO_4).

Sulfate—Dissolve 2 Gm. in 10 cc. of water, add, drop by drop, 5 cc. of hydrochloric acid and evaporate to dryness on a water bath: the residue, dissolved in 25 cc. of water, shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 729.

Ammonia precipitate—Dissolve 10 Gm. in 50 cc. of water, add an excess of sulfuric acid, evaporate and ignite gently until the residue is nearly dry. Cool, take up in about 100 cc. of water, add a few drops of methyl red T.S., and add ammonia T.S. carefully until the solution is just alkaline. Boil, filter (reserve the filtrate, but not the washings, for the calcium and magnesium test), wash, ignite, and weigh: the weight of the precipitate does not exceed 1.0 mg. (0.01 per cent).

Arsenic—Test 2 Gm. for arsenic by the method described on page 618: the stain produced corresponds to not more than 0.008 mg. of As_2O_3 (4 parts per million).

Calcium and magnesium—To the filtrate obtained from the test for *Ammonia precipitate* add 0.5 cc. of hydrochloric acid, 5 cc. of ammonium oxalate T.S., 2 cc. of

ammonium phosphate T.S. and 25 cc. of ammonia T.S., and allow to stand over night. If any precipitate is formed, filter, wash with water containing 2.5 per cent of ammonia, and dry. Mix the residue with about 20 mg. of sucrose and ignite to constant weight: the weight of the ignited residue should not exceed 1.5 mg. (0.015 per cent).

Heavy metals—Dissolve 2 Gm. in 10 cc. of water, cautiously add 5 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Test the residue for heavy metals as described in the *test for heavy metals in reagents*, page 730. The heavy metals limit for anhydrous potassium carbonate is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 730.

Sodium—A 20 per cent solution tested with a platinum wire in the flame should give no distinct yellow color to the flame (about 0.02 per cent Na).

Potassium Chlorate, $KClO_3$—Colorless crystals, white granules, or powder. Soluble in water, slightly soluble in alcohol.

Great caution should be observed in handling this salt as dangerous explosions are liable to occur when it is heated or subjected to concussion or to trituration with organic substances, such as cork, sugar, etc., or with charcoal, sulfur, sulfides, powdered metallic iron, or other easily oxidizable substances.

Assay—Weigh accurately about 100 mg. of potassium chlorate, dissolve it in 10 cc. of water in a 250-cc. flask, and add, from a burette, 35 cc. of acid ferrous sulfate T.S. Prepare a valve-stopper by taking a piece of rubber tubing of convenient diameter and about 5 cm. in length, place a piece of glass rod in one end, and slip the other end over a glass tube which passes through a perforated stopper of a size to fit the flask used. Cut a longitudinal slit about 15 mm. long in one side of the rubber tube about midway of its length. Insert this stopper in the flask and boil the mixture for 10 minutes. Cool the mixture, add 10 cc. of manganese sulfate T.S., and titrate the excess of ferrous sulfate with tenth-normal potassium permanganate. Conduct a blank test with another portion of 35 cc. of acid ferrous sulfate T.S., measured from a burette, and subtract the result of the former titration from that of the latter. Each cc. of tenth-normal potassium permanganate is equivalent to 2.043 mg. of $KClO_3$. Not less than 99 per cent of $KClO_3$ is found.

Insoluble, calcium and magnesium—Dissolve 10 Gm. in 200 cc. of hot water. Add 5 cc. of ammonium oxalate T.S., 3 cc. of ammonium phosphate T.S., and 30 cc. of stronger ammonia T.S. and allow to stand over night. If a precipitate is present, filter on asbestos, wash well with hot water, ignite, and weigh. The weight of the ignited precipitate does not exceed 1 mg. (0.01 per cent).

Chloride—Dissolve 1 Gm. in 20 cc. of warm water, cool, then add 3 drops of nitric acid, free from the lower oxides of nitrogen, and 1 cc. of silver nitrate T.S. Any turbidity produced is not greater than that of a control made with 0.02 mg. of Cl (0.002 per cent).

Nitrogen compounds—Dissolve 2 Gm. in 40 cc. of warm water, cool and add 10 cc. of 10 per cent sodium hydroxide solution and 500 mg. of fine aluminum wire in small pieces, and allow to stand for 3 hours protected from escape or access of ammonia, then decant 25 cc. and add to it 2 cc. of Nessler's reagent. The color produced is not greater than that produced by treating 0.08 mg. of ammonium chloride in the same manner as the potassium chlorate (0.001 per cent N).

Sulfate—Dissolve 2 Gm. in 50 cc. of water, add 1 cc. of diluted hydrochloric acid

and 2 cc. of barium chloride T.S. No turbidity or precipitate is formed in 30 minutes (about 0.01 per cent SO_4).

Heavy metals—To 2 Gm. add 5 cc. of water and 5 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Repeat the evaporation with 2 cc. of hydrochloric acid. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 730. The heavy metals limit for potassium chlorate is 10 parts per million.

Sodium—A 10 per cent solution in hot water tested on a platinum wire imparts no pronounced yellow color to a colorless flame (about 0.02 per cent Na).

Potassium Chloride, KCl—Colorless crystals or a white, granular powder. It is odorless. Very soluble in water, slightly soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 0.5 mg. (0.005 per cent), page 729.

Neutrality—Dissolve 5 Gm. in 50 cc. of carbon dioxide-free water and add 3 drops of phenolphthalein T.S.: no pink color should be produced. Add 0.2 cc. of fiftieth-normal sodium hydroxide solution: a pink color should be produced.

Chlorate and nitrate—Dissolve 1 Gm. in 10 cc. of water, add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid: the blue color should not be entirely destroyed in 5 minutes (about 0.001 per cent as ClO_3 or 0.003 per cent as NO_3).

Nitrogen compounds—Determine as described under *Oxalic Acid*, page 788, using 2 Gm. of potassium chloride and 10 cc. of 10 per cent sodium hydroxide solution. The color produced is not greater than that produced by the same treatment of a quantity of ammonium salt corresponding to 0.02 mg. of nitrogen (0.001 per cent of N).

Phosphate—Dissolve 5 Gm. in 20 cc. of water, add 10 cc. of nitric acid and evaporate to dryness. Dissolve the residue in 5 cc. of water, add 5 cc. of nitric acid, and re-evaporate to dryness. Dissolve the residue in 50 cc. of water, add 10 cc. of nitric acid, nearly neutralize with ammonia T.S., and proceed as described under *Potassium Carbonate, Anhydrous*, page 798. If a yellow precipitate is formed, it is not greater than that produced from 0.10 mg. of phosphate (PO_4) treated with the same quantities of the same reagents and in the same manner (0.002 per cent PO_4).

Sulfate—The sulfate in 2 Gm. corresponds to not more than 0.1 mg. of SO_4 (0.005 per cent), page 729.

Barium—Dissolve 4 Gm. in 20 cc. of water, filter if necessary, and divide in two portions. To one portion add 2 cc. of diluted sulfuric acid and to the other add 2 cc of water: the solutions should be equally clear at the end of 2 hours (about 0.001 per cent Ba).

Calcium, magnesium, and ammonia precipitate—Dissolve 10 Gm. in 75 cc. of water, add 5 cc. of ammonium oxalate T.S., 2 cc. of ammonium phosphate T.S. and 25 cc. of ammonia T.S. Allow to stand over night. Filter, wash with water containing 2.5 per cent of ammonia, and dry. Mix the residue with 20 mg. of sucrose and ignite to constant weight: the weight does not exceed 0.5 mg. (0.005 per cent).

Heavy metals—The heavy metals limit for potassium chloride is 5 parts per million, using 3 Gm. for the test, page 730.

Iron—The iron in 3 Gm. corresponds to not more than 0.010 mg. of Fe (about 3 parts per million), page 730.

Sodium—Test a 10 per cent solution of the potassium chloride on a platinum

wire in the flame: no pronounced yellow color should be produced (about 0.02 per cent of Na).

Potassium Chromate, K_2CrO_4—Yellow crystals, very soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. collected on an asbestos filter is not more than 1 mg. (0.01 per cent), page 729.

Free alkali—Dissolve 1 Gm. in 50 cc. of water, cool to 15°, and add 2 drops of phenolphthalein T.S.: if a pink color is produced, it should be discharged by the addition of not more than 0.2 cc. of tenth-normal acid.

Chloride—Dissolve 1 Gm. in 20 cc. of water, add 10 cc. of nitric acid, heat to about 50° and add a few drops of silver nitrate T.S.: no turbidity should develop within 5 minutes (about 0.005 per cent Cl).

Sulfate—Dissolve 1 Gm. in 20 cc. of water, add 5 cc. of hydrochloric acid and 2 cc. of barium chloride T.S.: no precipitate is formed in 1 hour.

Calcium—Dissolve 5 Gm. in 50 cc. of water, add a few drops of ammonia T.S. and 5 cc. of ammonium oxalate T.S., and allow to stand over night: if a precipitate is formed, it should not be greater than that formed in a slightly ammoniacal solution of equal volume containing 0.25 mg. of calcium and 5 cc. of ammonium oxalate T.S. (0.005 per cent).

Sodium—A 10 per cent solution, tested with a platinum wire, imparts no distinct yellow color to a flame (about 0.02 per cent of Na).

Potassium Citrate, $C_3H_4(OH)(COOK)_3.H_2O$—Use *Potassium Citrate*, page 425.

Potassium Cyanide, KCN—White fragments or granules. Freely soluble in water, slightly soluble in alcohol. Gradually decomposes in solution.

Caution—On account of the extremely poisonous nature of this reagent itself and of the gas evolved from it on treatment with acids, all tests must be made in a hood, with a strong draft, and special care must be taken to avoid inhalation of the fumes. Pipettes must not be used in measuring its solutions.

Assay—Weigh accurately about 500 mg. and dissolve it in a flask in 30 cc. of water. Add 3 drops of potassium iodide T.S. and 3 cc. of ammonia T.S. and titrate with tenth-normal silver nitrate to a slight permanent turbidity. Each cc. of tenth-normal silver nitrate is equivalent to 13.02 mg. of KCN. Not less than 95 per cent of KCN should be found.

Solution A—Dissolve 10.0 Gm. in sufficient water to make 200 cc., filter the solution if necessary and use it for the following tests:

Chloride—Transfer 20 cc. of Solution A, measured with a graduated cylinder, to a 100-cc. volumetric flask and dilute with 30 cc. of water. Add 25 cc. of solution of formaldehyde, mix well, and allow to stand for 10 minutes; then add 5 cc. of nitric acid and exactly 5 cc. of tenth-normal silver nitrate. Dilute with water to the 100-cc. mark and mix well. Filter through a dry filter into a dry flask, rejecting the first 10 cc. of the filtrate, then titrate the excess of silver nitrate in 50 cc. of the filtrate with tenth-normal ammonium thiocyanate, using 2 cc. of ferric ammonium sulfate T.S. as the indicator. It requires not less than 1.8 cc. of the thiocyanate (about 0.5 per cent Cl).

Ferrocyanide—Dilute 20 cc. of Solution A measured with a graduated cylinder, with 20 cc. of water, then add, *under a hood*, 3 cc. of hydrochloric acid and 1 drop of

freshly prepared ferric chloride T.S. Any blue or green color produced in 15 minutes is not darker than that of a control made with 2 mg. of potassium ferrocyanide (about 0.1 per cent as $Fe(CN)_6$).

Sulfate—Evaporate 10 cc. of Solution A, measured with a graduated cylinder, with 3 cc. of hydrochloric acid, to dryness on a steam bath *under a hood with a good draft.* Dissolve the residue in 20 cc. of water, add 0.5 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. If turbidity is produced, it is not greater than that in a control made with 0.1 mg. of SO_4 (0.02 per cent).

Sulfide—Dissolve 2 Gm. in 20 cc. of water, and divide into two equal portions. To one portion add 3 drops of alkaline lead solution (made by adding a 10 per cent sodium hydroxide solution to a 10 per cent lead acetate solution until the precipitate first formed redissolves): the solution exhibits no more color than the portion not treated with the alkaline lead solution.

Thiocyanate—To 20 cc. of Solution A, measured with a graduated cylinder, add, *under a hood,* 4 cc. of hydrochloric acid and 4 drops of ferric ammonium sulfate T.S. The color of the solution is not darker than that of a blank.

Heavy metals—Dilute 20 cc. of Solution A, measured with a graduated cylinder, with 10 cc. of water, and add 10 cc. of hydrogen sulfide T.S.; no darkening of the solution occurs, nor does a dark color appear when 7 cc. of the diluted hydrochloric acid is added to the solution, *under a hood.*

Sodium—Evaporate, *under a hood,* 2 cc. of Solution A, measured with a graduated cylinder, with 2 cc. of hydrochloric acid, to dryness. The solution of the residue in 5 cc. of water, tested on a platinum wire, imparts no pronounced yellow color to a colorless flame (about 0.1 per cent Na).

Potassium Dichromate, $K_2Cr_2O_7$—Dark yellowish red crystals or crystalline granules. Soluble in water, insoluble in alcohol.

Insoluble and ammonium hydroxide precipitate—To a solution of 10 Gm. in 100 cc. of hot water add 1 cc. of stronger ammonia T.S. and digest for 1 hour on a steam bath. Filter, wash thoroughly, ignite, and weigh. The weight of the ignited precipitate should not exceed 1.0 mg. (0.01 per cent).

Chloride—Dissolve 1 Gm. in 20 cc. of water, add 10 cc. of nitric acid, heat to about 50°, and add a few drops of silver nitrate T.S.: no turbidity should develop within 5 minutes (about 0.005 per cent Cl).

Sulfate—Dissolve 10 Gm. in 250 cc of water and 4 cc. of hydrochloric acid. Heat the solution to boiling and add 25 cc. of a solution containing 1 Gm. of barium chloride and 2 cc. of hydrochloric acid in each 100 cc. of solution. Digest on a water bath for 2 hours and allow to stand at room temperature over night. If any precipitate forms, filter, wash, ignite, and weigh. The weight of the residue after correcting for a complete blank should not exceed 1.2 mg. If the residue exceeds 1.2 mg., fuse it with 1 Gm. of anhydrous sodium carbonate. Extract the fused mass with water and filter off the insoluble residue. Add 5 cc. of hydrochloric acid to the filtrate, dilute to about 200 cc., heat to boiling, and add 10 cc. of alcohol. Digest on a water bath until the reduction of the chromate is complete, as indicated by the change to a clear green or colorless solution. Neutralize the solution with ammonia T.S., add 2 cc. of hydrochloric acid, heat to boiling, and add 10 cc. of barium chloride T.S. Digest on a water bath for 2 hours and allow to stand over night. If a precipitate is present, filter, wash, and ignite. The weight of the precipitate, after correcting for a complete blank is not more than 1.2 mg. (about 0.005 per cent of SO_4).

Calcium—Dissolve 5 Gm. in 50 cc. of hot water; add a slight excess of ammonia T.S. and 5 cc. of ammonium oxalate T.S.: any precipitate formed on standing over night should not be greater than that formed in a slightly ammoniacal solution of equal volume, containing 0.25 mg. of Ca and 5 cc. of ammonium oxalate T.S. (0.005 per cent Ca).

Sodium—A 10 per cent solution, tested with a platinum wire in the flame, imparts no distinct yellow color to the flame (about 0.02 per cent Na).

Potassium Ferricyanide, $K_3Fe(CN)_6$—Dark red crystals. Very soluble in water.

Assay—Weigh accurately about 700 mg., and dissolve it in 50 cc. of water in a glass-stoppered flask. Add 20 cc. of potassium iodide T.S., 1 drop of glacial acetic acid, and 15 cc. of zinc sulfate solution (1 in 10). Allow to stand for 30 minutes, then titrate the liberated iodine with tenth-normal sodium thiosulfate, adding starch T.S. as indicator toward the end. Each cc. of tenth-normal sodium thiosulfate corresponds to 32.92 mg. of $K_3Fe(CN)_6$.

Insoluble—The insoluble matter from 10 Gm., dissolved in 50 cc. of cold water without heating, is not more than 1.0 mg. (0.01 per cent), page 729.

Chloride—Dissolve 2 Gm. in 175 cc. of water, add 2.5 Gm. of cupric sulfate crystals (free from chloride) dissolved in 25 cc. of water, mix thoroughly, and allow to stand for 15 minutes. To 50 cc. of the clear, supernatant solution, add 2 cc. of nitric acid and 1 cc. of silver nitrate T.S.: any turbidity is not greater than that produced in a blank by 0.05 mg. of Cl (0.01 per cent of Cl), page 729.

Sulfate—Dissolve 5 Gm. in 100 cc. of water without heating, filter, and to the filtrate add 5 drops of glacial acetic acid and 5 cc. of barium chloride T.S.: no turbidity is produced in 10 minutes (about 0.01 per cent of SO_4).

Ferro compounds—Dissolve 4 Gm. in 400 cc. of water, add 10 cc. of 20 per cent sulfuric acid, and immediately follow with 0.1 cc. of tenth-normal potassium permanganate. The solution, after stirring, should retain a pink tint in comparison with a control test made with the same quantities of the same ferricyanide, water and acid [0.05 per cent of $Fe(CN)_6$].

Potassium Ferrocyanide, $K_4Fe(CN)_6.3H_2O$—Yellow, transparent crystals. Very soluble in water, insoluble in alcohol.

Assay—Weigh accurately about 1 Gm., dissolve it in 200 cc. of water, add 10 cc. of sulfuric acid, and titrate with tenth-normal potassium permanganate. Correct for a blank. Each cc. of tenth-normal potassium permanganate is equivalent to 42.24 mg. of $K_4Fe(CN)_6$.

Insoluble—The insoluble matter, from 10 Gm. dissolved in cold water without heating, is not more than 1.0 mg. (0.01 per cent), page 729.

Chloride—Determine as described under *Potassium Ferricyanide:* the turbidity corresponds to not more than 0.05 mg. of Cl (0.01 per cent).

Sulfate—It complies with the test as described under *Potassium Ferricyanide.*

Potassium Hydroxide, Reagent, KOH—Reagent Potassium Hydroxide conforms

to the requirements given under *Potassium Hydroxide*, page 426, and also meets the following tests:

Chloride—The chloride in 1 Gm. corresponds to not more than 0.1 mg. of Cl (0.01 per cent), page 729.

Nitrogen—Dissolve 2.5 Gm. in 40 cc. of water, add 500 mg. of aluminum wire, or foil, in small pieces, and allow to stand for 3 hours, protected from access of ammonia fumes. Dilute with water to 50 cc., decant 25 cc. of the clear liquid, and add 2 cc. of Nessler's reagent. The color produced is not darker than that in a control made with 0.04 mg. of ammonium chloride, 250 mg. of the hydroxide, and 2 cc. of Nessler's reagent in the same final volume (0.001 per cent N).

Sulfate—The sulfate from 1 Gm. corresponds to not more than 0.05 mg. of SO_4 (0.005 per cent), page 729.

Heavy metals—Dissolve 5 Gm. in 25 cc. of water, add 2 drops of phenolphthalein T.S. and just sufficient hydrochloric acid to discharge the pink color. Add diluted ammonium hydroxide until a slight pink color is produced, cool, and dilute to 50 cc. To 10 cc. of the solution add 2 cc. of acetic acid, 0.15 mg. of silver nitrate, dilute with water to 40 cc., and add 2 cc. of diluted acetic acid (A). To the remaining 40 cc. of the solution add 2 cc. of diluted acetic acid (B). Then add to each 10 cc. of hydrogen sulfide T.S.: B is not darker than A (about 30 parts per million).

Potassium Iodate, KIO_3—White, crystalline powder, soluble in water.

Insoluble—The insoluble matter from 10 Gm., dissolved in 150 cc. of hot water, is not more than 0.5 mg. (0.005 per cent), page 729.

Neutrality—Dissolve 3 Gm. in 40 cc. of warm water and add 3 drops of phenolphthalein T.S.: no pink color should be produced. Add 0.2 cc. of fiftieth-normal sodium hydroxide: a pink color should be produced.

Chloride and bromide—Mix 1 Gm. of the powdered potassium iodate with 2 Gm. of sucrose and ignite carefully at a low temperature, taking small portions at a time. Treat the residue with 10 cc. of hot water, and 1 cc. of dilute nitric acid (1 in 5), filter, and wash with 10 cc. of hot water. Cool and add 15 cc. of ammonia T.S. Add 20 cc. of 5 per cent silver nitrate solution with constant stirring, dilute to 50 cc., and filter. To 25 cc. of the filtrate add a slight excess of nitric acid. The turbidity is not greater than that produced by 0.10 mg. of chloride ion in an equal volume of solution containing the same quantities of the same reagents (about 0.02 per cent as Cl).

Chlorate—To 2 Gm. of the powdered potassium iodate add 2 cc. of reagent sulfuric acid: the salt should remain white and no odor or gas should be evolved (about 0.01 per cent ClO_3).

Iodide—Dissolve 1 Gm. in 20 cc. of water, add 1 cc. of chloroform and 0.5 cc. of normal sulfuric acid: no violet color should be produced in the chloroform in 1 minute (about 0.01 per cent I).

Nitrogen compounds—Dissolve 1 Gm. in 30 cc. of water, add 10 cc. of 10 per cent sodium hydroxide solution and 500 mg. of aluminum wire or foil in small pieces, distil off 50 cc., and to the distillate add 2 cc. of Nessler's reagent. The color is not greater than that produced in a similar volume of a solution obtained by the same treatment of a quantity of an ammonium salt corresponding to 0.05 mg. of nitrogen (0.005 per cent of N).

Sulfate—To 2 Gm. add 10 cc. of hydrochloric acid and evaporate to dryness. Repeat the evaporation twice with 5 cc. of the acid: the residue, dissolved in 25 cc. of

water, shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 729.

Heavy metals—To 2 Gm. add 5 cc. of water and 10 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Repeat the evaporation twice with 5 cc. of hydrochloric acid. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 730. The heavy metals limit for potassium iodate is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 730.

Sodium—Test a warm 10 per cent solution in the flame with a platinum wire: no pronounced yellow color is produced (about 0.03 per cent Na).

Potassium Iodide, KI—Use *Potassium Iodide*, page 427.

Potassium Nitrate, KNO_3—Colorless, transparent crystals or a white, crystalline powder. It is odorless.

Insoluble—The insoluble matter from 10 Gm. is not more than 0.5 mg. (0.005 per cent), page 729.

Neutrality—Dissolve 5 Gm. in 50 cc. of water free from carbon dioxide, and add 3 drops of phenolphthalein T.S.: no pink color should be produced, but on the addition of 0.2 cc. of fiftieth-normal sodium hydroxide a pink color should be produced.

Chlorine (*total*)—Ignite 2 Gm. at first gently, then for a few minutes at a low red heat, and cool: the residue, dissolved in 25 cc. of water, shows no more chloride than corresponds to 0.02 mg. of Cl (0.001 per cent), page 729.

Iodate and nitrite—Dissolve 1 Gm. in 10 cc. of water, add 2 drops of potassium iodide T.S., 1 cc. of chloroform, and 2 cc. of acetic acid. Shake the mixture gently for a few minutes. The chloroform should not acquire a pink or violet color (about 0.0005 per cent IO_3, and about 0.001 per cent NO_2).

Phosphate—Dissolve 5 Gm. in 50 cc. of water, add 10 cc. of nitric acid, nearly neutralize with ammonia T.S., and proceed with the test as described under *Ammonium Nitrate*, page 739. If a yellow precipitate is formed, it is not greater than that produced in a control test with 0.025 mg. of PO_4 (0.0005 per cent).

Sulfate—Dissolve 2 Gm. in 5 cc. of water, add 5 cc. of hydrochloric acid, evaporate to dryness, and re-evaporate to dryness with another 5 cc. of hydrochloric acid: the residue, dissolved in 25 cc. of water, shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 729.

Calcium, magnesium, and ammonia precipitate—Determine as described under *Potassium Chloride*, page 800: the weight does not exceed 1.0 mg. (0.01 per cent).

Heavy metals—The heavy metals limit for potassium nitrate is 5 parts per million, using 2 Gm. for the test, page 730.

Iron—The iron in 2 Gm. corresponds to not more than 0.006 mg. of Fe (3 parts per million), page 730.

Sodium—A 10 per cent solution, tested with a platinum wire, imparts no distinct yellow color to a flame (about 0.02 per cent Na).

Potassium Nitrite, KNO_2—White, or nearly white, deliquescent sticks or granules. Soluble in water, insoluble in alcohol.

Assay—Weigh accurately about 1 Gm. and dissolve it in sufficient water to measure exactly 100 cc. Add 10 cc. of this solution from a pipette to a mixture of 40 cc. of

tenth-normal potassium permanganate, 100 cc. of water and 5 cc. of sulfuric acid. In adding the potassium nitrite solution, immerse the tip of the pipette beneath the surface of the permanganate mixture. Allow to stand for 5 minutes, add 25 cc. of tenth-normal oxalic acid, and titrate with tenth-normal potassium permanganate. Each cc. of tenth-normal potassium permanganate is equivalent to 4.255 mg. of KNO_2. It shows not less than 85 per cent of KNO_2.

Chloride—The chloride in 500 mg. corresponds to not more than 0.1 mg. of Cl (0.02 per cent), page 729.

Sulfate—Dissolve 1 Gm. in 5 cc. of water, add 3 cc. of hydrochloric acid, evaporate to dryness on a water bath, and dissolve the residue in 100 cc. of water: 10 cc. of the solution, diluted to 25 cc. with water, shows no more sulfate than corresponds to 0.25 mg. of SO_4 (0.25 per cent), page 729.

Heavy metals—Dissolve 1 Gm. in 5 cc. of water and evaporate to dryness with 3 cc. of reagent hydrochloric acid. Dissolve the residue in 10 cc. of water and 1 cc. of normal hydrochloric acid and add 10 cc. of hydrogen sulfide T.S. Any darkening produced is not greater than that produced by 0.02 mg. of lead in an equal volume of solution containing the same quantities of the same reagents used in the test (20 parts per million).

Sodium—A 5 per cent solution, tested with a platinum wire, imparts no pronounced yellow color to a flame (about 0.02 per cent Na).

Potassium Oxalate, $K_2C_2O_4.H_2O$—Colorless or white crystals; efflorescent in dry air. Freely soluble in water; slightly soluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Neutrality—Dissolve 2 Gm. in 150 cc. of carbon dioxide-free water. Add 0.2 cc. of phenolphthalein T.S. and boil for 10 minutes while passing through the solution a current of carbon dioxide-free air. Prepare a color standard as follows: Dilute 10 cc. of tenth-normal sodium hydroxide to 100 cc. with carbon dioxide-free water and add 0.2 cc. of phenolphthalein T.S., then dilute 6 cc. of the red liquid to 150 cc. with carbon dioxide-free water. Titrate the hot potassium oxalate solution with hundredth-normal sodium hydroxide or with hundredth-normal hydrochloric acid until the color matches that of the standard. It requires not more than 0.8 cc. of hundredth-normal sodium hydroxide, and not more than 1.4 cc. of hundredth-normal hydrochloric acid.

Chloride—Ignite 2 Gm. and dissolve the residue in 20 cc. of water. Neutralize the solution with nitric acid and add 0.5 cc. excess of the acid. Filter and add to the filtrate 1 cc. of silver nitrate T.S.: any turbidity produced is not greater than that produced in a blank to which 0.04 mg. of Cl has been added (0.002 per cent).

Nitrogen compounds—Dissolve 1 Gm. in 50 cc. of water, add 10 cc. of 10 per cent sodium hydroxide solution and 500 mg. of fine aluminum wire in small pieces, and allow to stand 3 hours protected from loss or access of ammonia. Decant 30 cc. and add to it 1 cc. of Nessler's reagent. Any color produced is not darker than that produced by the same treatment of a quantity of an ammonium salt equivalent to 0.05 mg. nitrogen (0.01 per cent).

Sulfate—Ignite 2 Gm. in platinum protected from sulfur in a flame. Boil the residue with 20 cc. of water and 2 cc. of bromine T.S., then add 3 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Dissolve the residue in 20 cc. water and 1 cc. of normal hydrochloric acid, filter, and add to the filtrate 2 cc.

barium chloride T.S. Any resulting turbidity is not greater than that in a control made as follows: evaporate 2 cc. of bromine T.S. and 3 cc. of hydrochloric acid to dryness on a steam bath, dissolve the residue and 0.2 mg. of SO_4 in sufficient water to make 20 cc., then add 1 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. (0.01 per cent).

Heavy metals—Ignite 4 Gm. gently in porcelain. Add to the residue 5 cc. of water, 5 cc. of hydrochloric acid, and 2 cc. of nitric acid, and evaporate to dryness on a water bath. Dissolve the residue in 40 cc. of water and filter. To 10 cc. of the filtrate add 4 cc. of standard lead solution, page 657, dilute with water to 30 cc., and add 1 cc. of diluted acetic acid (A). To the remaining 30 cc. of the filtrate add 1 cc. of diluted acetic acid (B). Then to each add 10 cc. of hydrogen sulfide T.S.: B is no darker than A (20 parts per million).

Sodium—Ignite 1 Gm. in platinum and dissolve the residue in 10 cc. of diluted hydrochloric acid. The solution, tested on a platinum wire, imparts no distinct yellow color to a colorless flame (about 0.02 per cent Na).

Substances darkened by sulfuric acid—In a recently ignited test tube heat 1 Gm. with 10 cc. of reagent sulfuric acid until fumes of SO_3 are evolved: not more than a slight brownish tinge is produced.

Potassium Perchlorate, $KClO_4$—Colorless or white crystals. Soluble in 65 parts of cold water, in 15 parts of boiling water; insoluble in alcohol.

Chloride—Dissolve 1 Gm. in 20 cc. of hot water, add 1 cc. of nitric acid and 1 cc. of silver nitrate T.S. Any resulting turbidity is not greater than that produced in a blank to which 0.03 mg. of Cl has been added (0.003 per cent).

Chloride and chlorate—Dissolve 1 Gm. in 30 cc. of hot water and add 1 cc. of a fresh 10 per cent ferrous sulfate solution. Allow to stand for 3 minutes, then add 3 cc. of nitric acid and 1 cc. of silver nitrate T.S.: any turbidity produced is not greater than that produced in a blank to which 0.1 mg. of Cl has been added (0.01 per cent).

Nitrogen compounds—Dissolve 1 Gm. in 75 cc. of water, add 15 cc. of 10 per cent sodium hydroxide solution and 1 Gm. of powdered Devarda's alloy. Allow to stand 2 hours protected from loss or access of ammonia, then distil 50 cc. into 5 cc. of tenth-normal hydrochloric acid, and add to the distillate 1 cc. of 10 per cent sodium hydroxide solution and 2 cc. of Nessler's reagent: the color produced is not darker than that produced by treating 0.02 mg. of nitrogen (as NH_4Cl) in the same manner as the potassium perchlorate (0.002 per cent).

Sulfate—Dissolve 8 Gm. in 200 cc. of hot water and add 1 cc. of hydrochloric acid. Heat to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. Warm to dissolve any potassium perchlorate that may crystallize, filter, wash with hot water, and ignite: the weight of the barium sulfate is not more than 1.0 mg. (0.005 per cent as SO_4).

Calcium—Dissolve 1 Gm. in 20 cc. of hot water, add 5 drops of ammonia T.S. and 3 cc. of ammonium oxalate T.S.: no turbidity is produced in 5 minutes.

Heavy metals—Dissolve 500 mg. in 20 cc. of hot water, add 1 cc. of normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S.: no darkening is produced (about 20 parts per million).

Sodium—A 5 per cent solution in hot water, tested on a platinum wire, imparts no distinct yellow color to a colorless flame (about 0.02 per cent Na).

Potassium Permanganate, $KMnO_4$—Use *Potassium Permanganate*, page 428.

Potassium Phosphate, Dibasic (*Dipotassium Phosphate*), K_2HPO_4—White, somewhat hygroscopic granules or powder. Very soluble in water, slightly in alcohol.

Insoluble—The insoluble from 10 Gm. does not exceed 2.0 mg. (0.02 per cent), page 729.

Monobasic or tribasic salt—Dissolve 2 Gm. in 50 cc. of water in a flask and boil the solution for 5 minutes. Then cool to about 25°, and add 3 drops of phenolphthalein T.S. A red color is produced which is discharged by the addition of 1 cc. of normal hydrochloric acid.

Chloride—The chloride from 1 Gm. corresponds to not more than 0.10 mg. of Cl (0.01 per cent).

Nitrate—Dissolve 2 Gm. in 10 cc. of water, add 1 drop of diluted hydrochloric acid and 0.1 cc. of indigo carmine T.S., and follow with 10 cc. of sulfuric acid. The blue color persists for 5 minutes (about 0.005 per cent NO_3).

Sulfate—Dissolve 5 Gm. in 100 cc. of water and 5 cc. of hydrochloric acid and filter. Boil the filtrate, add 5 cc. of barium chloride T.S., and allow to stand over night. Filter any precipitate if present, wash it with hot water, and ignite. The weight of the precipitate does not exceed 10.0 mg. (0.08 per cent SO_4).

Ammonia—Dissolve 500 mg. in 20 cc. of water, add 5 cc. of sodium hydroxide T.S. and 1 cc. of Nessler's reagent. The resulting color is not darker than that of a control made with 0.05 mg. of NH_3 (0.01 per cent).

Arsenic—Test 200 mg. for arsenic as described on page 618. The stain produced corresponds to not more than 0.003 mg. of As_2O_3 (15 parts per million).

Heavy metals—Dissolve 1 Gm. in 30 cc. of water, add 2 drops of phenolphthalein T.S. and normal sulfuric acid until the red color just disappears. Add 5 cc. more of the acid, then 5 cc. of hydrogen sulfide T.S. Any color developed in 1 minute is not darker than that produced in a control made with 2 cc. of standard lead solution, page 657, and 0.5 cc. of normal sulfuric acid (20 parts per million).

Sodium—A 10 per cent solution, tested with a platinum wire, imparts no pronounced yellow color to a flame (about 0.02 per cent Na).

Potassium Sodium Tartrate—Use *Potassium Sodium Tartrate*, page 429.

Potassium Sulfate, K_2SO_4—Hard, colorless crystals, or white granules, or powder. Soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm., using 150 cc. of hot water, is not more than 1.0 mg. (0.01 per cent), page 729.

Neutrality—To a solution of 5 Gm. in 50 cc. of carbon dioxide-free hot water add 3 drops of phenolphthalein T.S.: no pink color should be produced (*alkali*) and on the addition of 1 drop of tenth-normal sodium hydroxide a pink color should be produced.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.01 mg. of Cl (0.001 per cent), page 729.

Nitrogen compounds—Dissolve 3 Gm. in 35 cc. of warm water in a flask, cool, add 10 cc. of 10 per cent sodium hydroxide solution and about 500 mg. of aluminum wire in small pieces, and allow to stand for 3 hours, the flask being suitably protected to prevent access or escape of ammonia. Decant 30 cc. and add 1 cc. of Nessler's reagent: the yellow color is not greater than that produced by the same treatment of a quantity of ammonium chloride corresponding to 0.01 mg. of nitrogen (0.0005 per cent of N).

Arsenic—Test 1 Gm. as described on page 618. The stain produced corresponds to not more than 0.003 mg. of As_2O_3 (3 parts per million).

Calcium, magnesium, and ammonia precipitate—Proceed as described under *Potassium Chloride*, page 800, using 5 Gm. of the potassium sulfate: the weight of the residue does not exceed 1.0 mg. (0.02 per cent).

Heavy metals—The heavy metals limit for potassium sulfate is 5 parts per million, using 2 Gm. for the test, page 730.

Iron—The iron in 2 Gm. corresponds to not more than 0.01 mg. of Fe (5 parts per million), page 730.

Sodium—A 10 per cent solution, tested with a platinum wire, imparts no distinct yellow color to a flame (about 0.02 per cent Na).

Potassium Thiocyanate, KSCN—Colorless, deliquescent crystals. Soluble in 0.5 part of water, freely soluble in alcohol.

Ammonia—Dissolve 1 Gm. in 10 cc. of water, add 5 cc. of sodium hydroxide T.S., and heat on a steam bath for 5 minutes: the odor of ammonia is not evolved.

Potassium thiocyanate also conforms to the tests given under *Ammonium Thiocyanate*, page 742, for *Insoluble*, *Chloride*, *Sulfate*, and *Heavy metals*, but omitting the test for *Residue on ignition*.

Potassium Xanthogenate (*Potassium Xanthate*), $KS_2COC_2H_5$—White or pale yellow crystals, or crystalline powder. It is very soluble in water, freely soluble in alcohol. It usually contains about 10 per cent of water. Keep in tightly closed containers.

Assay—Weigh accurately about 500 mg., and dissolve it in 50 cc. of water. Add to the solution 50 cc. of tenth-normal iodine, and allow to stand for 5 minutes; then add 2 cc. of glacial acetic acid, and titrate the excess of iodine with tenth-normal sodium thiosulfate, adding starch T.S. toward the end. One cc. of tenth-normal iodine is equivalent to 16.03 mg. of $KS_2COC_2H_5$. Not less than 87 per cent of $KS_2COC_2H_5$ should be found.

Insoluble—A solution of 1 Gm. in 5 cc. of water is complete, or practically so.

Alkalinity—Dissolve 1 Gm. in 20 cc. of water, add 3 drops of phenolphthalein T.S., and titrate with tenth-normal sulfuric acid. Not more than 2 cc. of the acid is required to discharge the pink color.

Sulfide—To 5 cc. of lead acetate T.S. add sodium hydroxide solution (1 in 10) until the precipitate first formed redissolves. Add 5 drops of this solution to a solution of 1 Gm. of the sample in 20 cc. of water: no darkening is produced in 2 minutes.

***n*-Propyl Alcohol** (*n-Propanol*), $CH_3.CH_2.CH_2.OH$—Clear, colorless liquid; alcohol-like odor. Miscible with water and the usual organic solvents. Specific gravity about 0.803.

Boiling range—Not less than 95 per cent distils between 95° and 98°.

Non-volatile—Evaporate 10 cc. of *n*-propyl alcohol on a steam bath and dry the residue for 1 hour at 110°. The weight of the residue does not exceed 1.0 mg.

Acid—To 20 cc. of water add 0.2 cc. of phenolphthalein T.S., then add tenth-normal sodium hydroxide, dropwise, until a slight pink color persists after shaking. Disregard the volume of sodium hydroxide required. Now add 10 cc. of the alcohol, mix, and titrate with tenth-normal sodium hydroxide until the pink color is reproduced: not more than 0.2 cc. of the sodium hydroxide is required.

Pumice—A substance of volcanic origin consisting chiefly of complex silicates of aluminum and alkali metals. It occurs as very light, hard, rough, porous, gray masses, or as a gray-colored powder. It is insoluble in water and is not attacked by diluted acids.

Acid- and water-soluble substances—Boil 2 Gm. of powdered Pumice with 50 cc. of diluted hydrochloric acid under a reflux condenser for 30 minutes. Cool, and filter. To half of the filtrate add 5 drops of sulfuric acid, evaporate to dryness, ignite, and weigh: the weight of the residue does not exceed 60 mg. (6 per cent).

Pyridine, C_5H_5N—Colorless, clear liquid, having a characteristic, disagreeable odor; hygroscopic. Miscible with water, alcohol, chloroform, and many other organic liquids. Specific gravity about 0.98. Keep in a tight container.

Boiling range—Not less than 90 per cent distils between 113° and 116°.

Non-volatile—Evaporate 10 cc. on a steam bath and dry the residue for 1 hour at 105°. The weight of the residue does not exceed 1 mg. (0.01 per cent).

Chloride—The chloride from 2 cc. of pyridine corresponds to not more than 0.02 mg. of Cl (0.001 per cent), page 729.

Sulfate—The sulfate from 2 cc. corresponds to not more than 0.1 mg. of SO_4 (0.005 per cent), page 729.

Ammonia—Mix 2 cc. with 10 cc. of boiled and cooled water and add 2 drops of phenolphthalein T.S. If a pink color is produced, it is discharged by 0.2 cc. of fiftieth-normal hydrochloric acid.

Copper—Mix 5 cc. with 15 cc. of water, add 2 cc. of glacial acetic acid, 5 cc. of 5 per cent ammonium thiocyanate solution, and 5 cc. of chloroform, shake vigorously, and allow to separate. The chloroform layer is not green and, at most, only slightly yellow.

Substances insoluble in water—Mix 5 cc. of pyridine with 45 cc. of water: a clear solution results.

Substances reducing permanganate—To 5 cc. add 0.5 cc. of tenth-normal potassium permanganate. The pink color does not entirely disappear in 15 minutes.

Pyridoxine Hydrochloride (*Vitamin B_6 Hydrochloride, Vitamin B_6*), $C_8H_{11}O_3N \cdot HCl$—White, crystalline powder; stable in air and slowly affected by sunlight. It melts with some decomposition between 204° and 208°. One Gm. dissolves in about 5 cc. of water and in about 90 cc. of alcohol. The solution is acid to litmus (pH about 3).

Loss on drying—When dried in a vacuum desiccator over sulfuric acid for 4 hours, the loss in weight does not exceed 0.5 per cent.

Residue on ignition—Not more than 0.1 per cent.

Ammonia—Dissolve 200 mg. in 10 cc. of water, add 3 cc. of sodium hydroxide T.S., and heat on a steam bath for 1 minute: the odor of ammonia is not evolved.

Heavy metals—Dissolve 500 mg. in 20 cc. of water and neutralize to litmus paper with dilute ammonia T.S.; then add 2 cc. of diluted acetic acid and dilute with water to 25 cc.: the heavy metals limit is 50 parts per million (page 730).

Nitrogen—When determined by the Kjeldahl method in a sample previously dried over sulfuric acid for 4 hours, not less than 6.6 per cent and not more than 6.9 per cent is found.

Pyrogallol, $C_6H_3(OH)_3$—White, lustrous crystals. Very soluble in water or alcohol. Melting range 131° to 133°. Sulfated ash not over 0.1 per cent.

Solubility—A freshly prepared solution of pyrogallol (1 in 20) in recently boiled water is colorless or, at most, only slightly yellow.

Pyrrole, C_4H_5N—A clear liquid; colorless when freshly distilled, becoming yellow in a few days; characteristic odor. Specific gravity about 0.94. It is insoluble in water, but soluble in alcohol, benzene, and in ether.

Boiling range—Not less than 90 per cent distils between 128° and 132°.

Quinine Sulfate—Use *Quinine Sulfate*, page 442.

Red Mercuric Iodide—See *Mercuric Iodide, Red*, page 782.

Resazurin (Sodium), $C_{12}H_6NO_4Na$—Brownish purple, crystalline powder. It is soluble in water, forming a violet-colored solution. One Gm. dissolves in 100 cc. of water forming a deep violet-colored solution.

Hydrogen sulfide and other compounds containing the thiol group decolorize solutions of Resazurin Sodium forming dihydroresorufin. On shaking the decolorized solution in the presence of air a rose color develops due to the formation of resorufin.

Resorcinol, $C_6H_4(OH)_2$—Use *Resorcinol*, page 445.

Salicylic Acid, $C_6H_4(OH)COOH$—Use *Salicylic Acid*, page 462.

Sand, Washed—It may be prepared in the following manner: digest clean, hard sand at room temperature with a mixture of 1 part of hydrochloric acid and 2 parts of water (about 13 per cent of HCl) for several days, or at an elevated temperature for several hours. Collect the sand on a filter, wash with water until the washings are neutral and show only a slight reaction for chloride, and finally dry. Washed sand meets the following tests:

Substances soluble in hydrochloric acid—Digest 10 Gm. of washed sand with a mixture of 10 cc. of hydrochloric acid and 40 cc. of water on a steam bath for 4 hours, replacing from time to time the water lost by evaporation. Filter, and to 25 cc. of the filtrate add 5 drops of sulfuric acid, evaporate and ignite to constant weight: the weight of the residue does not exceed 8.0 mg.

Chloride—Shake 1 Gm. with 20 cc. of water for 2 minutes, filter, and add to the filtrate 1 cc. of nitric acid and 1 cc. of silver nitrate T.S.: any turbidity produced corresponds to not more than 0.05 mg. of Cl (0.005 per cent).

Sawdust, Purified—It may be prepared as follows: extract sawdust in a percolator, first with a 1 per cent solution of sodium hydroxide, then with a 1 per cent solution of hydrochloric acid until the acid percolate gives no test for alkaloid with mercuric potassium iodide T.S. or with iodine T.S. Then wash with water until free from acid and soluble salts, and dry. Purified sawdust meets the following test:

Alkaloids—To 5 Gm. of purified sawdust contained in a flask, add 50 cc. of ether-chloroform mixture and 10 cc. of ammonia T.S. and shake frequently during 2 hours. Decant 20 cc. of the clear, ethereal liquid, and evaporate to dryness. Dissolve the residue in 2 cc. of normal hydrochloric acid and divide into 2 portions. To 1 portion add mercuric potassium iodide T.S. and to the other add iodine T.S.: no turbidity is produced in either portion.

Selenium, Se—Dark red, amorphous or bluish black, crystalline powder. It is

insoluble in water; soluble in solutions of fixed alkali hydroxides or sulfides.

Residue on ignition—Ignite 1 Gm. at a temperature not above 500°. The weight of the residue does not exceed 10 mg. (1 per cent).

Nitrogen—Heat 1 Gm. with 10 cc. of sulfuric acid in a Kjeldahl flask over a free flame until the selenium is dissolved and the volume of acid is reduced to about 5 cc. Cool, *cautiously* dilute with 100 cc. of water, add an excess of 30 per cent sodium hydroxide, and at once connect the flask with a suitable condenser, and distil about 100 cc. into 5 cc. of water containing 1 drop of diluted hydrochloric acid. Dilute the distillate with water to make 200 cc. and mix well. To 40 cc. add 2 cc. of sodium hydroxide T.S. and 2 cc. of alkaline mercuric-potassium iodide T.S. Any resulting color is not darker than is produced by treating 0.2 mg. of ammonium chloride in the same manner as the sample (0.005 per cent N).

Selenious Acid, H_2SeO_3—Colorless crystals. Efflorescent in dry air and hygroscopic in moist air. Soluble in water and in alcohol.

Semicarbazide Hydrochloride, $NH_2CONHNH_2.HCl$.—A white to slightly yellow, crystalline powder. Freely soluble in water; sparingly soluble in alcohol. It melts between 175° and 185° with decomposition.

Solubility—One Gm. in 20 cc. of water forms a clear, practically colorless solution.

Residue on ignition (sulfated)—Not more than 0.2 per cent.

Melting range of the acetone-carbazone—Dissolve 1.5 Gm. sodium acetate in 10 cc. of water, add 0.5 cc. of acetone and follow with 0.5 Gm. of the sample. Shake vigorously for 2 minutes and allow to stand for 15 minutes with occasional vigorous shaking: a white precipitate of the carbazone forms, which, after filtering, washing with water and drying over sulfuric acid, melts between 184° and 187°.

Silver Nitrate, $AgNO_3$—Reagent silver nitrate conforms to the requirements given under *Silver Nitrate*, page 476, and also meets the following test:

Substances not precipitated by hydrochloric acid—Dissolve 10 Gm. in 200 cc. of water, heat to boiling, and add hydrochloric acid to precipitate the silver completely. Allow to stand over night, then filter, and wash with about 50 cc. of water, containing 1 cc. of nitric acid. Evaporate the filtrate and washings to dryness, add to the residue 3 drops of hydrochloric acid and 10 cc. of water, heat to boiling, and filter. Evaporate the resulting filtrate to dryness and dry the residue for 3 hours at 110°. Run a blank test and deduct the weight of the blank from that obtained in the test with the silver nitrate. The quantity of the corrected residue is not more than 1 mg. (0.01 per cent).

Silver Sulfate, Ag_2SO_4—Small, white, lustrous crystals or a white powder. Slightly soluble in water. Dissolved by nitric acid and by ammonia T.S.

Insoluble and chloride—Add 5 Gm. of the powdered salt to 500 cc. of boiling water and boil gently until the silver sulfate is dissolved. If any insoluble residue remains, filter while hot through asbestos in a Gooch crucible, wash with hot water until the washings show no reaction with hydrogen sulfide and dry at 105°. The weight of the residue does not exceed 1 mg. (0.02 per cent).

Nitrate—To 500 mg. of the powdered salt add 2 cc. of phenoldisulfonic acid T.S., heat on a water bath for 15 minutes, cool, dilute with 10 cc. of water and render alkaline with ammonia T.S. Any yellow color produced is not greater than that

produced when a quantity of potassium nitrate equivalent to 0.005 mg. of NO_3 is evaporated to dryness and treated with the same quantities of the same reagents. (0.001 per cent of NO_3)

Substances not precipitated by hydrochloric acid—Heat to boiling the filtrate obtained in the test for *Insoluble and chloride*, add 5 cc. of reagent hydrochloric acid, and allow to stand over night. Add water to measure 500 cc. and filter. Evaporate 300 cc. of the filtrate to dryness, add 3 drops of hydrochloric acid and 10 cc. of water, heat, and filter. Evaporate the filtrate to dryness, dry at 110° for 3 hours, and weigh. Run a blank and deduct the weight obtained in the blank from that obtained in the original test: the corrected weight of the residue should not exceed 1.0 mg. (about 0.03 per cent).

Iron—Dissolve the residue obtained in the test for *Substances not precipitated by hydrochloric acid* by warming it with a few drops of hydrochloric acid. Dilute to 25 cc., add 2 cc. of hydrochloric acid and 3 cc. of ammonium thiocyanate T.S. Any red color produced should correspond to not more than 0.06 mg. of Fe (20 parts per million).

Keep silver sulfate in light-resistant containers.

Sodium Acetate, $NaC_2H_3O_2.3H_2O$—Colorless or white crystals or granules, or fused lumps. Very soluble in water; sparingly soluble in alcohol.

Insoluble, calcium and magnesium—Dissolve 10 Gm. in 50 cc. of water, add 5 cc. of ammonium oxalate T.S., 2 cc. of ammonium phosphate T.S., and 15 cc. of stronger ammonia water, and allow to stand over night. If any precipitate is formed, filter, wash it well with water containing 2.5 per cent of NH_3, ignite, and weigh. The weight of the ignited precipitate does not exceed 1 mg. (0.01 per cent).

Neutrality—Dissolve 5 Gm. in 100 cc. of carbon dioxide-free water, cool to 10°, and add 5 drops of phenolphthalein T.S. If a pink color is produced, it is discharged by not more than 0.5 cc. of fiftieth-normal sulfuric acid. If no pink color is produced, the addition of 0.5 cc. of fiftieth-normal sodium hydroxide produces a pink color.

Chloride—A 2-Gm. portion shows no more chloride than corresponds to 0.02 mg. of Cl (0.001 per cent), page 729.

Phosphate—Dissolve 5 Gm. in 50 cc. of water, add 10 cc. of nitric acid, and nearly neutralize with stronger ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake at about 40° for 5 minutes, and allow to stand for 30 minutes. If a yellow precipitate is formed, it is not greater than that produced when a quantity of potassium biphosphate, equivalent to 0.025 mg. of PO_4, is treated in the same manner (0.0005 per cent).

Sulfate—A 2-Gm. portion shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent), page 729.

Heavy metals—The heavy metals limit for sodium acetate is 10 parts per million, using 2 Gm. for the test and acidifying the solution with 2 cc. of normal hydrochloric acid, page 730.

Iron—The iron in 2 Gm. corresponds to not more than 0.01 mg. of Fe (5 parts per million), page 730.

Substances reducing permanganate—Dissolve 5 Gm. in 50 cc. of water, add 5 cc. of diluted sulfuric acid and 0.1 cc. of tenth-normal potassium permanganate. The pink color does not entirely disappear in 1 hour.

Sodium Acetate, Anhydrous, $NaC_2H_3O_2$—Grayish white masses or powder. It is hygroscopic and freely soluble in water.

Loss on drying—Dry about 1 Gm., accurately weighed, to constant weight at 120°: the loss in weight corresponds to not more than 3.0 per cent.

Neutrality—Dissolve 5 Gm. in 100 cc. of carbon dioxide-free water. Cool to 10° and add 3 drops of phenolphthalein T.S. If a pink color is produced, it should be discharged by the addition of 0.5 cc. of fiftieth-normal hydrochloric acid. If no pink color is produced, the addition of 0.5 cc. of fiftieth-normal sodium hydroxide should produce a pink color (about 0.02 per cent alkali as Na_2CO_3 or about 0.012 per cent acid as CH_3COOH).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.15 mg. of Cl (0.015 per cent), page 729.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 729.

Heavy metals—The heavy metals limit for anhydrous sodium acetate is 15 parts per million, using 2 Gm. for the test and acidifying the solution with 3 cc. of normal hydrochloric acid, page 730.

Keep anhydrous sodium acetate in tight containers.

Sodium Alizarinsulfonate (*Alizarin Red S*), $C_{14}H_5O_2(OH)_2SO_3Na.H_2O$—A yellow brown or orange yellow powder. Freely soluble in water, producing a yellow color; sparingly soluble in alcohol.

Sensitiveness—Add 3 drops of a 1 per cent solution of sodium alizarinsulfonate to 100 cc. of water and follow with 0.05 cc. of tenth-normal sodium hydroxide: a red color is produced. Upon the subsequent addition of 0.05 cc. of tenth-normal hydrochloric acid the original yellow color returns.

Sodium Ammonium Phosphate (*Microcosmic Salt*), $NaNH_4HPO_4.4H_2O$—Colorless crystals or white granules. Freely soluble in water; insoluble in alcohol. It effloresces in the air and loses ammonia.

Insoluble, and ammonium hydroxide precipitate—Dissolve 10 Gm. in 100 cc. of water, add 10 cc. of ammonia T.S. and heat on a steam bath for 1 hour. If any precipitate is formed, filter, wash well with water, and ignite. The weight of the ignited precipitate is not more than 1 mg. (0.01 per cent).

Chloride—The chloride from 1 Gm. corresponds to not more than 0.02 mg. of Cl (0.002 per cent Cl), page 729.

Nitrate—Dissolve 1 Gm. in 10 cc. of water, add 0.1 cc. of indigo carmine T.S., then add, with stirring, 10 cc. of sulfuric acid. The blue color persists for 10 minutes (about 0.005 per cent NO_3).

Sulfate—Dissolve 10 Gm. in 100 cc. of water, add 5 cc. of hydrochloric acid, and filter if necessary. Heat the filtrate to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night. If a precipitate is present, filter, wash it well with hot water, and ignite. The weight of the precipitate of barium sulfate does not exceed 5 mg. (0.02 per cent SO_4).

Heavy metals—Dissolve 3 Gm. in 25 cc. of water, add 15 cc. of normal sulfuric acid, then add 10 cc. of hydrogen sulfide T.S. Any color developed in 1 minute is not darker than a control made with 3 cc. of standard lead solution, page 657, and 0.5 cc. of normal sulfuric acid (10 parts per million).

Assay for ammonia—Weigh accurately about 500 mg. and dissolve in 150 cc. of

water in a Kjeldahl flask, connected with a distillation trap to a condenser, the tip of which dips under the surface of 40 cc. of tenth-normal sulfuric acid. Add to the flask 25 cc. of 10 per cent sodium hydroxide solution and distil until about 125 cc. of distillate has collected in the receiver, then titrate the excess acid with tenth-normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of tenth-normal acid is equivalent to 1.703 mg. of NH_3. Not less than 7.7 per cent of NH_3 should be found.

Sodium Bicarbonate, $NaHCO_3$—Use *Sodium Bicarbonate*, page 485.

Sodium Bisulfite (*Sodium Acid Sulfite*), $NaHSO_3$—White crystals or a white, granular powder, having an odor of sulfur dioxide. Freely soluble in water, slightly soluble in alcohol.

Assay—Use the method of assay as outlined under *Sodium Sulfite, Exsiccated*, page 507. Each cc. of tenth-normal iodine corresponds to 5.204 mg. of $NaHSO_3$. It should contain not less than 90 per cent of $NaHSO_3$.

Arsenic—Add 1 cc. of nitric acid to 200 mg. and evaporate to dryness: the residue meets the requirements of the arsenic test, page 618.

Heavy metals—Dissolve 2 Gm. in 10 cc. of water, add 5 cc. of reagent hydrochloric acid, and evaporate to dryness on a water bath. Dissolve the residue in 1 cc. of tenth-normal hydrochloric acid and 20 cc. of water, and add 10 cc. of hydrogen sulfide T.S. Any darkening produced is not greater than that produced by 0.02 mg. of Pb in an equal volume of solution containing the same quantities of the same reagents used in the test (10 parts per million).

Iron—Evaporate 1 Gm. with 2 cc. of hydrochloric acid to dryness on a water bath, treat the residue with 2 cc. of hydrochloric acid and 20 cc. of water, and add a few drops of bromine T.S. Boil off the bromine, cool, dilute with water to 20 cc., and add 3 cc. of ammonium thiocyanate T.S. Any red color produced is not greater than that produced in a control test made with 0.05 mg. of Fe (50 parts per million).

Keep in well-filled, tight containers in a cool place.

Sodium Bitartrate, $NaHC_4H_4O_6.H_2O$—White crystals or a crystalline powder. Soluble in cold water.

Assay—Weigh accurately about 500 mg., dissolve in 30 cc. of water, and titrate with tenth-normal sodium hydroxide, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal sodium hydroxide is equivalent to 19.01 mg. of $NaHC_4H_4O_6.H_2O$. It contains not less than 99 per cent of $NaHC_4H_4O_6.H_2O$.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.2 mg. of Cl (0.02 per cent), page 729.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 729.

Heavy metals—Dissolve 2 Gm. in about 15 cc. of water, add to the solution 2 drops of phenolphthalein T.S., and follow with ammonia T.S. until the solution is slightly pink. Then add 2 cc. of normal hydrochloric acid and dilute to 30 cc.: the heavy metals limit is 10 parts per million, page 730.

Sodium Borate, $Na_2B_4O_7.10H_2O$—Use *Sodium Borate*, page 486.

Sodium Bromide, NaBr—Use *Sodium Bromide*, page 487.

Sodium Carbonate, Anhydrous, Na_2CO_3—A white, hygroscopic powder. It is soluble in water, insoluble in alcohol.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Loss on ignition—Ignite 1 Gm. at a temperature not over 350°: the loss in weight should not exceed 10 mg. (1.0 per cent).

Chloride—The chloride in 1 Gm. corresponds to not more than 0.05 mg. of Cl (0.005 per cent), page 729.

Nitrogen compounds—Determine as described under *Oxalic Acid*, page 788, using 10 cc. of 10 per cent sodium hydroxide solution. The color produced is not darker than that produced by the same treatment of a quantity of ammonium salt corresponding to 0.02 mg. of nitrogen (0.001 per cent of N).

Phosphate—Determine as described under *Potassium Carbonate, Anhydrous*, page 798: the precipitate or turbidity corresponds to not more than that produced by 1 cc. of standard phosphate solution, page 731 (0.002 per cent).

Sulfate—Dissolve 2 Gm. in 10 cc. of water, add, drop by drop, 5 cc. of hydrochloric acid, and evaporate to dryness on a water bath: the residue, dissolved in 25 cc. of water, shows no more sulfate than corresponds to 0.1 mg. of SO_4 (0.005 per cent).

Ammonia precipitate—Determine as described under *Potassium Carbonate, Anhydrous.* The weight of the precipitate does not exceed 1.0 mg. (0.01 per cent).

Arsenic—Test 2 Gm. by the method described on page 618: the stain produced corresponds to not more than 0.008 mg. of As_2O_3 (4 parts per million).

Calcium and magnesium—Determine as described under *Potassium Carbonate, Anhydrous.* The weight of the ignited residue does not exceed 1.5 mg. (0.015 per cent).

Heavy metals—Dissolve 2 Gm. in 10 cc. of water, cautiously add 5 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Test the residue for heavy metals as described in the test for *heavy metals in reagents*, page 730. The heavy metals limit is 5 parts per million.

Iron—The iron in 2 Gm. corresponds to not more than 0.02 mg. of Fe (10 parts per million), page 730.

Potassium—Dissolve 2 Gm. in a small volume of water and neutralize with hydrochloric acid. Evaporate this solution to dryness on a water bath and redissolve the residue in 15 cc. of water. Add 5 cc. of sodium cobaltinitrite T.S. and allow to stand over night. Any precipitate formed should not be greater than that produced by an amount of potassium chloride equivalent to 0.40 mg. of K, dissolved in 15 cc. of water, treated with 5 cc. of sodium cobaltinitrite T.S. and allowed to stand over night (0.02 per cent of K).

Sodium Carbonate. Monohydrated, $Na_2CO_3.H_2O$—Use *Sodium Carbonate, Monohydrated*, page 483.

Sodium Chloride, NaCl—Colorless, odorless, transparent crystals or a white powder.

Insoluble—The insoluble matter from 20 Gm. is not more than 1.0 mg. (0.005 per cent).

Neutrality—It meets the requirements of this test as described under *Potassium Chloride*, page 800.

Chlorate and nitrate—Dissolve 2 Gm. in 10 cc. of water, add 0.1 cc. of indigo carmine T.S. and 10 cc. of sulfuric acid: the blue color should not be entirely destroyed in 10 minutes (about 0.001 per cent as ClO_3 or 0.003 per cent as NO_3).

Nitrogen compounds—Dissolve 2 Gm. in 40 cc. of water in a flask, add 10 cc. of 10 per cent sodium hydroxide solution and about 500 mg. of aluminum wire in small pieces. Allow to stand for 3 hours protected against loss or access of ammonia. Then decant 25 cc. and add 2 cc. of Nessler's reagent: any color produced is not darker than that produced by the same treatment of a quantity of an ammonium salt equivalent to 0.02 mg. of nitrogen (0.001 per cent of N).

Phosphate—Dissolve 10 Gm. in 40 cc. of water and 15 cc. of nitric acid. Evaporate to dryness, take up with 15 cc. of water and 5 cc. of nitric acid, and again evaporate to dryness. Take up with 10 cc. of nitric acid, dilute with 50 cc. of water, and nearly neutralize with ammonia T.S. Add 50 cc. of ammonium molybdate T.S., shake (at about 40°) for 5 minutes, and allow to stand for 30 minutes. Any precipitate produced is not greater than is produced by treating 0.5 cc. of standard phosphate solution, page 731, in the same manner (0.0005 per cent).

Sulfate—Dissolve 10 Gm. in 100 cc. of water, add 1 cc. of hydrochloric acid, heat to boiling, add 5 cc. of barium chloride T.S., and allow to stand over night: no turbidity or precipitate is produced.

Ammonium hydroxide precipitate—Dissolve 10 Gm. in about 100 cc. of water, add a few drops of ammonia T.S., and boil gently in a covered beaker until the ammonia is expelled: no precipitate should be formed.

Barium—It meets the requirements of the test described under *Potassium Chloride*, page 800.

Calcium and magnesium—To the solution obtained in the test for *ammonium hydroxide precipitate* add 5 cc. of ammonium oxalate T.S., 2 cc. of ammonium phosphate T.S. and 20 cc. of ammonia T.S., and allow to stand over night. If a precipitate is formed, filter through a small paper, wash with water containing 2.5 per cent of ammonia, ignite, and weigh: the weight should not exceed 0.5 mg. (0.005 per cent).

Heavy metals—The heavy metals limit for Sodium Chloride is 5 parts per million, using 3 Gm. for the test, page 730.

Iron—The iron in 3 Gm. corresponds to not more than 0.010 mg. of Fe (about 3 parts per million), page 730.

Potassium—Dissolve 5 Gm. in 20 cc. of water, add 5 cc. of sodium cobaltinitrite T.S., and allow to stand over night: any precipitate formed should not be greater than that produced by an amount of potassium chloride equivalent to 0.50 mg. of K dissolved in 20 cc. of water, treated with 5 cc. of the same sodium cobaltinitrite T.S. as used in the test, and allowed to stand over night (0.01 per cent of K).

Sodium Citrate—Use *Sodium Citrate*, page 491.

Sodium Cobaltinitrite, $Na_3Co(NO_2)_6$—A yellow to brownish yellow powder. Freely soluble in water.

Solubility—A solution of 1 Gm. in 10 cc. of water is clear or not more than faintly turbid.

Sensitiveness—Dissolve 3 Gm. in 10 cc. of water and add this solution to a solution

of 1.0 mg. of potassium chloride in a mixture of 1 cc. of glacial acetic acid and 5 cc. of water. A distinct precipitate is produced in 1 hour.

Sodium Dichromate, $Na_2Cr_2O_7.2H_2O$ (for chromic acid cleaning mixture)—Orange red crystals or granules. Very soluble in water; insoluble in alcohol.

Sodium Diethyl-dithiocarbamate, $(C_2H_5)_2N.CS_2Na$—White, or slightly brown, or slightly pink crystals. Freely soluble in water, and in alcohol. The solution is alkaline to phenolphthalein. The addition of acid to the solution (1 in 20) produces a white turbidity due to the formation of carbon disulfide.

Sodium Fluoride, NaF—A white, odorless powder, soluble in water.

Insoluble—Dissolve 2 Gm. in 100 cc. of warm water in a platinum dish and allow to stand on a steam bath for 1 hour. Filter through asbestos in a Gooch crucible, wash thoroughly with hot water, dry at 105° to 110°, and weigh. The weight should not exceed 1.0 mg. (0.050 per cent).

Loss on drying—When dried at 200° for 4 hours, the loss in weight corresponds to not more than 1 per cent.

Chloride—Dissolve 300 mg. in 20 cc. of water, add 200 mg. of boric acid, 1 cc. of nitric acid, and 1 cc. of tenth-normal silver nitrate: any turbidity produced is not greater than that produced in a blank made with 0.03 mg. of Cl (0.01 per cent).

Free acid—Dissolve 2 Gm. in 40 cc. of water in a platinum dish and add 10 cc. of a saturated solution of potassium nitrate. Cool the solution to 0°, and add 3 drops of phenolphthalein T.S. If no pink color appears, titrate with tenth-normal sodium hydroxide until a pink color is produced which persists for 15 seconds: it requires not more than 2 cc. of the tenth-normal sodium hydroxide (0.2 per cent HF).

Free alkali—If a pink color is produced in the test for *Free acid* on the addition of the phenolphthalein T.S., titrate with tenth-normal acid, stirring the liquid only gently, until the pink color is discharged: not more than 0.5 cc. of the acid is required (0.25 per cent as Na_2CO_3).

Fluosilicate—After the solution from the preceding tests has been neutralized, heat it to boiling and titrate while hot with tenth-normal sodium hydroxide until a permanent pink color is obtained: it requires not more than 1.5 cc. of the tenth-normal sodium hydroxide (0.35 per cent Na_2SiF_6).

Sulfate—Evaporate 500 mg. in a platinum dish 4 or 5 times, using 10 cc. of hydrochloric acid each time, and evaporating to dryness the last time: the residue shows no more sulfate than corresponds to 0.15 mg. of SO_4 (0.03 per cent SO_4), page 729.

Sulfite—Dissolve 6 Gm. in 150 cc. of water, add 2 cc. of reagent hydrochloric acid and a few drops of starch T.S., and titrate immediately with tenth-normal iodine. It should require not more than 0.1 cc. to produce a blue color (0.005 per cent SO_3).

Heavy metals—Treat 2 Gm. in a platinum dish with 10 cc. of reagent hydrochloric acid and evaporate to dryness. Repeat with another 10 cc. of reagent hydrochloric acid. Warm the residue with a few drops of hydrochloric acid and dilute to 40 cc. Neutralize 20 cc. of this solution (keep the remainder for the iron test) with ammonia T.S. Add 1 cc. of tenth-normal hydrochloric acid and 10 cc. of hydrogen sulfide T.S. Any brown color produced should not be greater than that produced by 0.03 mg. of lead in an equal volume of water containing the same quantities of the same reagents used in the test (30 parts per million).

Iron—To the remaining 20 cc. from the test for *heavy metals* add 2 cc. of reagent hydrochloric acid, filter if necessary, and add 3 cc. of ammonium thiocyanate T.S. Any red color produced should be less than that produced by 0.03 mg. of Fe (30 parts per million).

Sodium Hydrosulfite, $Na_2S_2O_4$—A white or grayish white crystalline powder. Soluble in water; slightly soluble in alcohol. It gradually oxidizes in the air, more readily when in solution, to bisulfite and bisulfate, acquiring an acid reaction. It is also affected by light.

Assay—Weigh accurately about 1 Gm. of sodium hydrosulfite, dissolve it in a mixture of 10 cc. of formaldehyde T.S. and 10 cc. of water contained in a small glass-stoppered flask, and allow to stand for 30 minutes with frequent agitation. Transfer the solution to a 250-cc. volumetric flask, add 150 cc. of water and 3 drops of methyl orange T.S., and follow, drop by drop, with normal sulfuric acid to a slightly acid reaction. Dilute with water to 250 cc. and mix well. To 50 cc. of the dilution add 2 drops of phenolphthalein T.S. and just sufficient tenth-normal sodium hydroxide to produce a slight, pink color, then titrate with tenth-normal iodine, using starch T.S. as the indicator. Now discharge the blue color of the solution with a drop of tenth-normal sodium thiosulfate and then titrate with tenth-normal sodium hydroxide to a pink color. Each cc. of tenth-normal sodium hydroxide is equivalent to 3.482 mg. of $Na_2S_2O_4$. It indicates not less than 88 per cent $Na_2S_2O_4$.

Sulfide—Add 10 per cent sodium hydroxide solution to lead acetate T.S. until the precipitate redissolves. Add 5 drops of this solution to a solution of 1 Gm. of the sodium hydrosulfite in 10 cc. of water: there should be no immediate darkening.

Heavy metals—Dissolve 1 Gm. in 10 cc. of water, add 10 cc. of hydrochloric acid, and evaporate to dryness on a steam bath. Dissolve the residue in 20 cc. of water and 0.5 cc. of diluted hydrochloric acid, filter, and add to the filtrate 10 cc. of hydrogen sulfide T.S.: no darkening is produced. Now make the solution alkaline with ammonia T.S.: a slight, greenish color may be produced, but not a dark or white precipitate.

Sodium Hydroxide, Reagent, NaOH—Reagent Sodium Hydroxide conforms to the requirements given under *Sodium Hydroxide*, page 494, and also meets the following tests:

Chloride—The chloride in 1 Gm. corresponds to not more than 0.1 mg. of Cl (0.01 per cent), page 729.

Nitrogen—Dissolve 0.5 Gm. in 40 cc. of water, add 500 mg. of aluminum wire or foil, in small pieces, and allow to stand for 3 hours protected from access of ammonia fumes. Dilute with water to 50 cc., decant 25 cc. of the clear liquid, and add 2 cc. of Nessler's reagent. The color produced is not darker than that in a control made with 0.04 mg. of ammonium chloride, 250 mg. of the hydroxide, and 2 cc. of Nessler's reagent in the same final volume (0.001 per cent N).

Sulfate—The sulfate from 1 Gm. corresponds to not more than 0.05 mg. of SO_4 (0.005 per cent), page 729.

Heavy metals—Dissolve 5 Gm. in 25 cc. of water, add 2 drops of phenolphthalein T.S. and just sufficient hydrochloric acid to discharge the pink color. Add diluted ammonium hydroxide until a slight pink color is produced, cool, and dilute to 50 cc. To 10 cc. add 2 cc. of diluted acetic acid, 0.15 mg. of silver nitrate, dilute with water to 40 cc., and add 2 cc. of diluted acetic acid (A). To the remaining 40 cc. of the

solution add 2 cc. of diluted acetic acid (B). Then add to each 10 cc. of hydrogen sulfide T.S.: B is not darker than A (about 30 parts per million).

Sodium Nitrite, $NaNO_2$—Use *Sodium Nitrite*, page 500.

Sodium Nitroprusside (*Sodium Nitroferricyanide*), $Na_2Fe(NO)(CN)_5.2H_2O$—Transparent, dark red crystals, very soluble in water.

Insoluble—Dissolve 10 Gm. in 100 cc. of water at room temperature, filter immediately, wash thoroughly, dry at 105° to 110°, and weigh. The weight of the residue should not exceed 1.0 mg. (0.01 per cent).

Chloride—Test as described under *Potassium Ferricyanide*, page 803. If a turbidity is produced, it corresponds to not more than 0.15 mg. of Cl (0.03 per cent), page 729.

Sulfate—It complies with the test for *sulfate* as described under *Potassium Ferricyanide*, page 803.

Sodium Oxalate, $Na_2C_2O_4$—A white, crystalline powder, slightly soluble in water.

Insoluble—The insoluble matter from 10 Gm., dissolved in 400 cc. of hot water, does not exceed 1.0 mg. (0.01 per cent), page 729.

Neutrality—Dissolve 2 Gm. in 150 cc. of carbon dioxide-free water. Add 0.2 cc. of phenolphthalein T.S. and boil the solution in a flask of resistant glass for 10 minutes while passing through it a current of air free from carbon dioxide. Prepare a color standard by adding 0.2 cc. of phenolphthalein T.S. to 150 cc. of carbon dioxide-free water, containing 10 cc. of tenth-normal sodium hydroxide, and diluting 6 cc. of this red liquid to 100 cc. with carbon dioxide-free water. Titrate the hot sodium oxalate solution with one-hundredth-normal acid or alkali as required to bring its color to match that of the prepared standard. Not more than 0.8 cc. of one-hundredth-normal acid, or 0.4 cc. of one-hundredth-normal alkali is required (limit of alkalinity, equivalent to 0.021 per cent of Na_2CO_3; limit of acidity, equivalent to 0.022 per cent of $NaHC_2O_4$).

Loss on drying—Dry 10 Gm. of the sodium oxalate to constant weight at 105° to 110°: the loss should not exceed 1.0 mg. (0.01 per cent).

Chloride—Ignite 1 Gm. to carbonate: dissolve this residue in 25 cc. of water, neutralize with nitric acid, filter if necessary, and add sufficient water to measure 50 cc. To 25 cc. of this solution add 3 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S.: any turbidity produced is not greater than that produced in a blank to which 0.01 mg. of Cl has been added (0.002 per cent), page 729.

Sulfate—Ignite 5 Gm. in a platinum crucible protected from contamination with sulfur. Add to the residue 20 cc. of water and 2 cc. of bromine T.S. and boil gently for a few minutes. Then add 10 cc. of hydrochloric acid and 20 mg. of anhydrous sodium carbonate and evaporate to dryness on a steam bath. Dissolve the residue in 20 cc. of water, add 1 cc. of normal hydrochloric acid, filter if necessary, and add to the filtrate 2 cc. of barium chloride T.S. Any resulting turbidity is not greater than that in a control made as follows: evaporate 10 cc. of hydrochloric acid, 2 cc. of bromine T.S. and 20 mg. of sodium carbonate to dryness on a steam bath, dissolve the residue and potassium sulfate, equivalent to 0.1 mg. of SO_4, in 20 cc. of water, and add 1 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. (0.002 per cent SO_4).

Heavy metals—Test as described under *Potassium Oxalate*, page 806: it conforms to the limit for heavy metals there stated.

Iron—Ignite 5 Gm. to carbonate and dissolve the residue in 25 cc. of water. Neutralize with hydrochloric acid and add an excess of 2 cc. of the hydrochloric acid. Add 1 drop of bromine and boil until nearly all of the color has disappeared. After the solution has cooled to room temperature, add sufficient water to measure 50 cc., and 5 cc. of ammonium thiocyanate T S Any resulting red color is not greater than that produced in a blank test by 50 mg. of Fe (10 parts per million).

Potassium—Ignite 5 Gm. of the salt to carbonate in a platinum crucible, dissolve it in a small amount of water, and neutralize the solution with hydrochloric acid. Evaporate this solution to dryness on a water bath and redissolve the residue in 15 cc. of water. Add 5 cc. of sodium cobaltinitrite T.S. and allow to stand over night. Any precipitate formed should not be greater than that produced by an amount of potassium chloride equivalent to 0.50 mg. of K, dissolved in 15 cc. of water, treated with 5 cc. of the same sodium cobaltinitrite T.S. as used in the test, and allowed to stand over night (0.01 per cent of K).

Substances darkened by hot sulfuric acid—Heat 1 Gm. in a recently ignited test tube with 10 cc. of reagent sulfuric acid until the appearance of fumes of sulfur trioxide: the acid should not acquire more than a faint, brownish tinge.

Sodium Perchlorate, $NaClO_3 \cdot H_2O$—White, deliquescent crystals. One Gm. dissolves completely in 10 cc. of water.

Chloride—Not more than 0.1 mg. from 1 Gm. (0.01 per cent Cl), page 729.

Nitrogen compounds Test as described for *Potassium Perchlorate*, page 807. The color produced is not darker than that produced from 0.03 mg. of nitrogen (0.003 per cent N).

Sulfate—The sulfate from 1 Gm. corresponds to not more than 0.2 mg. of SO_4, page 729 (0.02 per cent).

Heavy metals—It conforms to the test for heavy metals under *Potassium Perchlorate*, page 807 (20 parts per million).

Sodium Peroxide, Na_2O_2—A white, or yellowish white, very hygroscopic powder. It is freely soluble in water with the evolution of oxygen.

Assay—Weigh carefully about 700 mg and add slowly to a mixture of 400 cc. of water and 5 cc. of sulfuric acid which has been cooled to 10°. Dilute to 500 cc., mix well, and titrate 100 cc. with tenth-normal potassium permanganate Each cc. of tenth-normal potassium permanganate is equivalent to 3.90 mg. of Na_2O_2. It contains not less than 90 per cent of Na_2O_2.

Chloride—Add 1 Gm., in small portions, to 20 cc. of water, cool, add 5 cc. of nitric acid, filter, if necessary, and add 1 cc. of tenth-normal silver nitrate. If a turbidity is produced, it corresponds to not more than 0.02 mg. of Cl (0.002 per cent).

Nitrogen compounds—Dissolve 1 Gm. in 20 cc. of water cooled with ice, add acetic acid until neutral, add an excess of 3 drops, and boil down to a volume of 10 cc. Cool, dilute with 20 cc. of water, add 20 cc. of 10 per cent sodium hydroxide solution and 500 mg. of aluminum wire in small pieces, and allow to stand for 3 hours protected against loss or access of ammonia. Decant 25 cc. of the clear liquid and add to it 2 cc. of Nessler's reagent: any color produced is not greater than that obtained

by treating a quantity of a nitrate equivalent to 0.030 mg. of N in the same manner as in the test (0.003 per cent).

Sulfate—Dissolve carefully 20 Gm. in 200 cc. of water, concentrate to about 100 cc., cool, neutralize to litmus paper with hydrochloric acid, and add an excess of 1 cc. of the acid. Filter if necessary, heat the filtrate to boiling, add 5 cc. of barium chloride T.S., heat on a water bath for 2 hours, and allow to stand for 18 hours. If a precipitate is formed, filter, wash, and ignite. The weight of the precipitate does not exceed 1.0 mg. (about 0.002 per cent as SO_4).

Heavy metals—Carefully add 2 Gm. to a mixture of 5 cc. of hydrochloric acid and 15 cc. of water and evaporate to dryness. Dissolve the residue in 25 cc. of water and add 10 cc. of hydrogen sulfide T.S. Any brown color produced is not darker than that produced by 4 cc. of standard lead solution, page 657, treated in the same manner (20 parts per million).

Iron—Carefully add 1 Gm. to a mixture of 2 cc. of nitric acid and 10 cc. of water and evaporate to dryness. Treat the residue with 2 cc. of hydrochloric acid and 10 cc. of water, warming slightly. Cool, dilute to 20 cc., and add 3 cc. of ammonium thiocyanate T.S. Any red color produced is not darker than that produced by 0.03 mg. of Fe treated in the same manner (30 parts per million).

Sodium Phosphate—Use *Sodium Phosphate*, page 502.

Sodium Salicylate—Use *Sodium Salicylate*, page 504.

Sodium Sulfate, Anhydrous, Na_2SO_4 (*for dehydrating liquids*)—White, fine powder. Soluble in water; insoluble in alcohol.

Insoluble—The insoluble from 5 Gm. is not more than 1 mg. (0.02 per cent), page 729.

Loss on ignition—Ignite about 2 Gm., accurately weighed, to constant weight: the loss in weight does not exceed 0.5 per cent.

Free alkali, free acid—Dissolve 5 Gm. in 60 cc. of carbon dioxide-free water and add 3 drops of phenolphthalein T.S.: no pink color is produced. Now add 0.5 cc. of fiftieth-normal sodium hydroxide: a pink color is produced.

Alcohol-soluble substances—Shake 2 Gm. with 20 cc. of alcohol for 5 minutes and allow to stand for 1 hour with frequent agitation. Filter through a filter paper moistened with alcohol, evaporate the filtrate in a tared dish, and dry at 110° C. for 2 hours. The weight of the residue does not exceed 1 mg. (0.05 per cent).

Sodium Sulfide, $Na_2S.9H_2O$—Clear, colorless, deliquescent crystals. Very soluble in water. A solution (1 in 10) is alkaline to litmus paper and has the odor of hydrogen sulfide.

Ammonium compounds—Dissolve 2 Gm. in 80 cc. of water, add a solution of 3.5 Gm. of lead acetate in 20 cc. of water, and allow the precipitate to settle. Decant 50 cc. of this solution, add an excess of sodium hydroxide T.S. and then water to make 100 cc. Distil off 50 cc. and add to the distillate 2 cc. of Nessler's reagent: the color is not greater than that produced by a quantity of an ammonium salt equivalent to 0.02 mg. of nitrogen, after correction is made for any nitrogen in the lead acetate, sodium hydroxide, and water used in the test (0.002 per cent N).

Sulfite and thiosulfate—Dissolve 3 Gm. in 200 cc. of water, free from oxygen, and add a solution of 5 Gm. of zinc sulfate in 100 cc. of water, free from oxygen. Shake the mixture well, allow to stand for 30 minutes, filter, and titrate 100 cc. of the filtrate with tenth-normal iodine, using starch T.S. as the indicator: not more than 0.3 cc.

of the iodine solution should be required (about 0.10 per cent as SO_2).

Iron—Dissolve 5 Gm. in 100 cc. of water. The solution should be clear and colorless.

Sodium Sulfite, Anhydrous (*Exsiccated Sodium Sulfite*), Na_2SO_3—A white powder. Freely soluble in water, slightly soluble in alcohol.

Assay—Weigh accurately about 250 mg. and add it to 50 cc. of tenth-normal iodine (the sulfite must be added to the iodine solution). Allow to stand for 5 minutes, add 1 cc. of hydrochloric acid and titrate the excess iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 6.303 mg. of Na_2SO_3. It contains not less than 97 per cent of Na_2SO_3.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.0 mg. (0.01 per cent), page 729.

Free acid—Dissolve 1 Gm. in 10 cc. of water and add 2 drops of phenolphthalein T.S.: a pink color should be produced.

Free alkali—Dissolve 1 Gm. in 10 cc. of water and add 1.5 cc. of 30 per cent hydrogen peroxide solution which has been previously neutralized to methyl red T.S. Shake the mixture well and allow it to stand for 5 minutes. Titrate with tenth-normal acid, using methyl red T.S. as the indicator: not more than 0.6 cc. of the tenth-normal acid should be required to neutralize the solution (about 0.3 per cent as Na_2CO_3).

Chloride—Dissolve 500 mg. in 10 cc. of water, add 10 cc. of hydrogen peroxide T.S., and dilute with water to 100 cc.: a 20-cc. portion of the solution shows no more chloride than corresponds to 0 02 mg. of Cl (0.02 per cent), page 729.

Arsenic—Dissolve 1 Gm. in 10 cc. of water, add 1 cc. of reagent sulfuric acid, evaporate to about 1 cc. on a water bath, and test as described on page 618: the stain corresponds to not more than 0.003 mg. of As_2O_3 (3 parts per million).

Heavy metals—Dissolve 6 Gm. in 30 cc. of hot water, add slowly 12 cc. of hydrochloric acid and evaporate to dryness on a steam bath. Add 15 cc. of hot water and 3 cc. of hydrochloric acid, re-evaporate to complete dryness and dissolve the residue in 60 cc. of water. To 10 cc. of the solution add 0.04 mg. of Pb dilute to 30 cc. and add 2 cc. of diluted acetic acid (A). To 30 cc. of the remaining solution add 2 cc. of diluted acetic acid (B); then to each add 10 cc. of hydrogen sulfide T.S.: B is not darker than A (20 parts per million).

Iron—To 10 cc. of the solution remaining from the preceding test, add 2 cc. of hydrochloric acid and 5 drops of bromine T.S. and boil to expel the excess of bromine. Cool, dilute with water to 20 cc. and add 2 cc. of ammonium thiocyanate T.S.: any red color produced corresponds to not more than 0.01 mg. of Fe (10 parts per million).

Sodium Tartrate, $Na_2C_4H_4O_6.2H_2O$—Transparent crystals. Very soluble in water, insoluble in alcohol.

Free alkali or free acid—To a solution of 2 Gm. in 20 cc. of water add 2 drops of phenolphthalein T.S. If a pink color is produced, it should be discharged by not more than 0.1 cc. of tenth-normal acid; if no pink color is produced, the addition of not more than 0.1 cc. of tenth-normal sodium hydroxide should produce a pink color.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.15 mg. of Cl (0.015 per cent), page 729.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 729.

Heavy metals—The heavy metals limit is 10 parts per million, using 2 Gm. for the test and acidulating with 2 cc. of normal hydrochloric acid, page 730.

Sodium Thioglycollate, $HSCH_2.COONa$—A white, crystalline powder having a slight characteristic odor. It is very soluble in water, but slightly soluble in alcohol. It is hygroscopic, and oxidizes in the air. *Keep in tight, light-resistant containers.* It should not be used if it is pale yellow or darker in color.

Assay—Weigh accurately about 250 mg., and dissolve it in 50 cc. of oxygen-free water. Add 5 cc. of diluted hydrochloric acid, and boil for 2 minutes, cool, and titrate the solution with tenth-normal iodine, adding starch T.S. toward the end. One cc. of tenth-normal iodine is equivalent to 11.41 mg. of $HSCH_2.COONa$. Not less than 75 per cent of $HSCH_2.COONa$ should be found.

Insoluble—A solution of 1 Gm. in 10 cc. of water is clear, and practically complete.

Sulfide—Dissolve 500 mg. in 10 cc. of water in a small flask, add 2 cc. of hydrochloric acid, then place a strip of filter paper, moistened with lead acetate solution, over the mouth of the flask, and bring the solution to a boil: the lead acetate paper is not darkened.

Sodium Thiosulfate, $Na_2S_2O_3.5H_2O$—Use *Sodium Thiosulfate,* page 508.

Sodium Tungstate, $Na_2WO_4.2H_2O$—Colorless crystals, white, crystalline lumps or powder.

Insoluble—The insoluble matter from 10 Gm. is not more than 1.5 mg. (0.015 per cent), page 729.

Alkalinity—Dissolve 2 Gm. in 50 cc. of cold water and add 2 drops of phenolphthalein T.S.: a pink color should be produced which should be discharged by the addition of not more than 0.4 cc. of tenth-normal acid (0.20 per cent as Na_2CO_3).

Chloride—Dissolve 1 Gm. in 20 cc. of water, add 5 cc. of nitric acid, filter, and add to the filtrate 1 cc. of tenth-normal silver nitrate. Any turbidity produced in 2 minutes is not greater than that produced in a blank test by 0.02 mg. of Cl (0.002 per cent), page 729.

Molybdenum—Dissolve 2 Gm. in 10 cc. of water and render it slightly alkaline, if necessary, with dilute sodium hydroxide T.S. Dissolve in this solution 500 mg. of potassium xanthogenate without warming. Add 10 cc. of chloroform, followed by dilute sulfuric acid (1 in 10), shaking after each addition until the color in the chloroform is no longer intensified. Any resulting color should not be greater than that produced by 0.03 mg. of molybdic anhydride (corresponding to 0.02 mg. of molybdenum) in an equal volume of solution containing the same quantities of the reagents used in the test (0.001 per cent of Mo).

Nitrogen compounds—Dissolve 3 Gm. in 40 cc. of water, add 20 cc. of 10 per cent sodium hydroxide and 500 mg. of aluminum wire. Allow to stand for 3 hours, protected from loss or absorption of ammonia, then decant 40 cc. of the liquid, and add to it 2 cc. of Nessler's reagent. The color produced is not darker than that of a control made by treating a quantity of ammonium chloride equivalent to 0.03 mg. of nitrogen in the same manner as the sodium tungstate (0.001 per cent).

Sulfate—Dissolve 2 Gm. in 15 cc. of water, add 5 cc. of nitric acid, evaporate to dryness on a water bath, and heat at 110° for 30 minutes. Warm the residue with 25 cc. of water and 1 cc. of hydrochloric acid, dilute to 50 cc. with water and filter. To 25 cc. of the filtrate add 2 cc. of barium chloride T.S.: any turbidity produced in

10 minutes is not greater than that produced in a blank test by 0.2 mg. of SO_4 (0.02 per cent), page 729.

Heavy metals—Dissolve 1 Gm. in 20 cc. of water. Add 2 cc. of ammonia T.S. and 5 cc. of hydrogen sulfide T.S.: no brown color is produced. If a green color is produced, it corresponds to not more than 0.02 mg. of Fe (20 parts per million), page 730.

Stannous Chloride, $SnCl_2\ 2H_2O$—Colorless crystals, very soluble in water. The solution requires the presence of some hydrochloric acid to prevent the formation of basic chloride.

Insoluble in hydrochloric acid—Heat 5 Gm. to 40° in a mixture of 5 cc. of water and 5 cc. of hydrochloric acid: complete solution results.

Sulfate—Dissolve 5 Gm. in 5 cc. of reagent hydrochloric acid, dilute the solution to 50 cc. with water, heat to boiling, add 5 cc. of barium chloride T.S., and allow the mixture to stand over night: no precipitate should be formed (about 0.003 per cent SO_4).

Ammonium compounds—Gently heat about 100 mg. with 5 cc. of sodium hydroxide T.S.: the escaping vapors do not turn moistened red litmus paper blue.

Arsenic—Dissolve 5 Gm. in 10 cc. of hydrochloric acid, heat to boiling, and allow to stand for 1 hour. The solution should have no more color than a freshly prepared solution of 5 Gm. of stannous chloride in 10 cc. of hydrochloric acid (about 2 parts per million).

Substances not precipitated by hydrogen sulfide—Dissolve 4 Gm. in 10 cc. of hydrochloric acid, dilute to 200 cc., and precipitate the tin with hydrogen sulfide. Filter and evaporate 100 cc. of the filtrate to a few cc., add a few drops of sulfuric acid, evaporate to dryness, ignite gently, and weigh: the weight of the residue should not exceed 1.0 mg. (0.050 per cent).

Iron—Warm the residue obtained in the previous test with 1 cc. of hydrochloric acid and a small crystal of potassium chlorate until chlorine is no longer evolved. Dilute with 20 cc. of water, add 2 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate T.S.: the red color is not darker than that produced by 0.06 mg. of Fe treated in the same manner (30 parts per million).

Other metals—Dissolve 1 Gm. in a mixture of 2 cc. of hydrochloric acid and 3 cc. of nitric acid. Boil until solution is complete and brown fumes are no longer given off in abundance. Cool and dilute with water to 10 cc. To 5 cc. add 10 per cent sodium hydroxide solution until the precipitate first formed is redissolved. Cool, dilute to 40 cc. with water, and add 10 cc. of hydrogen sulfide T.S. Any brown color produced is not greater than that produced by 0.1 mg. of lead treated in the same manner (100 parts per million).

Starch, Arrowroot—The starch separated from the root of *Maranta arundinacea* Linné (Fam. *Marantaceæ*). A white powder consisting of starch grains of characteristic shape and appearance when examined microscopically.

Sensitiveness—Mix 100 cc. of water with 10 cc. of potassium iodide solution (1 in 100) and add 3 cc. of starch T.S. prepared from the material being tested. On the addition of 0.1 cc. of two-hundredth-normal iodine to the mixture a distinct blue color is produced.

Starch, Potato—The starch separated from the tubers of *Solanum tuberosum* Linné (Fam. *Solanaceæ*). A more or less finely granular powder, consisting of starch grains of characteristic shape and appearance when examined microscopically.

Strychnine Sulfate—Use *Strychnine Sulfate*, page 520.

Sucrose, $C_{12}H_{22}O_{11}$—Use *Sucrose*, page 524.

Sulfanilic Acid, $C_6H_4NH_2(SO_3H).2H_2O$—Colorless, acicular, efflorescent crystals. Sparingly soluble in water, very slightly soluble in alcohol and in ether.

Insoluble in sodium carbonate solution—Dissolve 5 Gm. in 50 cc. of a clear 5 per cent solution of sodium carbonate (anhydrous), and allow it to stand for 1 hour. If an insoluble residue remains, filter, wash with cold water, and dry at 105°: the weight of the residue should not exceed 1.0 mg. (not more than 0.02 per cent).

Residue on ignition—Ignite 3 Gm.: the weight of the residue should not exceed 1.0 mg. (0.03 per cent).

Chloride—Boil 4 Gm. with 100 cc. of water until dissolved, cool, dilute with water to 100 cc., mix well, and filter. A 25-cc. portion of this filtrate shows no more chloride than 0.02 mg. of Cl (0.002 per cent), page 729.

Sulfate—Evaporate 50 cc. of the filtrate obtained in the *chloride* test to about 20 cc. Cool on ice, filter, and wash with water to 25 cc. The filtrate shows no more sulfate than corresponds to 0.2 mg. of SO_4 (0.01 per cent), page 729.

Nitrite—Add 500 mg. to 50 cc. of water and add 5 cc. of sulfanilic α-naphthylamine T.S. Heat on a water bath, shaking the mixture until the sulfanilic acid is in solution. This solution should show no more pink color than a blank containing 5 cc. of the reagent mixed with 50 cc. of water (about 0.0005 per cent NO_2).

Sulfosalicylic Acid, $C_6H_3(OH)(SO_3H)COOH.2H_2O$—White or not more than slightly pinkish, needle-like crystals or a crystalline powder. Soluble in water and in alcohol.

Assay—Weigh accurately about 500 mg. of the acid, dried at from 105° to 110°, to constant weight, dissolve it in 50 cc. of water, and titrate with tenth-normal alkali, using phenolphthalein T.S. as the indicator. Each cc. of tenth-normal alkali is equivalent to 10.9 mg. of $C_6H_3(OH)(SO_3H)COOH$. It shows not less than 99 per cent of $C_6H_3(OH)(SO_3H)COOH$.

Residue on ignition—Ignite 1 Gm.: not more than 1.5 mg. of residue remains (0.15 per cent).

Sulfate—The sulfate in 500 mg. corresponds to not more than 0.3 mg. of SO_4 (0.06 per cent), page 729.

Salicylic acid—Dissolve 2 Gm. of the acid in 20 cc. of water in a separator, add 5 drops of reagent hydrochloric acid, and extract the solution with 10 cc. of chloroform. Draw off the chloroform, wash the chloroform twice with 3 cc. of water, then filter through a small filter, moistened with chloroform, into a weighed dish, and evaporate the chloroform completely at a temperature not above 60°. The weight of the residue should not exceed 1.0 mg. (0.05 per cent).

Loss on drying—Weigh accurately about 1 Gm., dry at 105° to 110° to constant weight: the loss in weight does not exceed 16 per cent.

Sulfur, S—Use *Precipitated Sulfur*, page 543.

Sulfuric Acid, H_2SO_4—A colorless, odorless liquid of oily consistency.

Color—Mix the acid in the original container and transfer 10 cc. to a test tube (150 mm. by 20 mm.). Compare it with water in a similar tube. The liquids should be equally clear and free from suspended matter, and on being viewed across the

columns by transmitted light there should be no apparent difference in color. Cautiously dilute a portion with water until about double-normal, and compare as before. No difference in turbidity should be observed.

Assay—Weigh accurately about 1 cc. in a tared, glass-stoppered flask. Dilute cautiously with 25 cc. of water, and titrate with normal sodium hydroxide, using methyl red T.S. as the indicator. Each cc. of normal sodium hydroxide is equivalent to 49.04 mg. of H_2SO_4. It contains not less than 94 per cent of H_2SO_4.

Non-volatile matter—Evaporate 55 cc. to dryness in platinum, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 0.5 mg. (0.0005 per cent).

Chloride—Dilute 5 cc. with water to 50 cc. and cool. Add 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S. The turbidity is not greater than that produced by 0.005 mg. of chloride ion in 50 cc. of water to which are added 1 cc. of diluted nitric acid and 1 cc. of silver nitrate T.S. (0.00005 per cent of Cl).

Nitrate—Add 10 cc. to 5 cc. of water containing 0.10 cc. of a solution of indigo carmine T.S. (1 in 1000). The blue color should not be completely discharged in 5 minutes (about 0.0002 per cent).

Ammonia—To 30 cc. of water add 3 cc. of the acid, render alkaline with 30 per cent solution of sodium hydroxide, and add 1 cc. of Nessler's reagent: the color is not more intense than is produced in a blank made with a quantity of ammonium chloride corresponding to 0.015 mg. of NH_3 (0.0003 per cent NH_3).

Arsenic—Add 3 cc. of nitric acid to 55 cc. and evaporate to about 10 cc. A second or third evaporation to the production of SO_3 fumes, after dilution with water, may be necessary to remove all of the nitrate. Cool, dilute the residue with 40 cc. of water, and determine the arsenic as outlined on page 618. Special care in making blank tests is necessary in this determination. The stain produced corresponds to not more than 0.004 mg. of As_2O_3 (0.04 parts per million).

Heavy metals—Dilute 5 cc. to 50 cc. with water, saturate with hydrogen sulfide, and make alkaline with ammonia T.S.: no brown color is produced. If a greenish color is produced, it is not greater than that produced in a blank test by a volume of standard ferric ammonium sulfate, corresponding to 0.01 mg. of Fe (1 part per million).

Substances oxidizable by permanganate—Dilute 20 cc. with 60 cc. of water, cool to 25°, and add 0.05 cc. of tenth-normal potassium permanganate: the mixture should remain pink for not less than 5 minutes (about 0.0005 per cent as SO_2).

Sulfuric Acid, Diluted (10 per cent)—Cautiously add 57 cc. of sulfuric acid to about 100 cc. of water, cool to room temperature and dilute with water to 1000 cc.

Sulfuric Acid, Fuming, H_2SO_4 plus free SO_3—A heavy, fuming, colorless, oily liquid.

Assay—Accurately weigh a glass-stoppered flask containing about 50 cc. of water, then cautiously add about 1 cc. of the acid, and reweigh. Titrate with normal sodium hydroxide, using methyl orange T.S. as the indicator. It shows not less than 84 per cent of total sulfur trioxide. Each cc. of normal sodium hydroxide is equivalent to 40.03 mg. of SO_3.

Non-volatile—Evaporate 5 cc. in a platinum dish and ignite at cherry redness for 5 minutes. Cool and weigh: the weight of the residue does not exceed 2.0 mg. (0.02 per cent).

Nitrate—Cautiously add 3 cc. to 5 cc. of water. To the mixture, while still hot, add about 5 mg. of sodium chloride and 2 drops of indigo carmine T.S.: the blue color is not discharged in 5 minutes (0.002 per cent NO_3).

Sulfurous Acid—A water solution of sulfur dioxide. It oxidizes in the air. Keep in small bottles.

Assay—Tare a glass-stoppered, Erlenmeyer flask containing 50 cc. of tenth-normal iodine. Quickly add about 2 cc. of the acid, stopper, and weigh. Titrate the excess of iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Each cc. of tenth-normal iodine is equivalent to 3.203 mg. of SO_2. It contains not less than 6 per cent of SO_2.

Non-volatile matter—Evaporate 20 cc. to dryness, ignite at cherry redness for 5 minutes, cool, and weigh: the weight of the residue should not exceed 1.0 mg. (0.005 per cent).

Chloride—Digest 10 cc. with 2 cc. of nitric acid on a water bath for 1 hour and dilute with water to 25 cc.: this solution shows no more chloride than corresponds to 0.05 mg. of Cl (0.0005 per cent), page 729.

Arsenic—Mix 5 cc. with 0.5 cc. of sulfuric acid and evaporate on a water bath until free from sulfur dioxide and the volume has been reduced to about 2 cc. Dilute to 5 cc. and test as described on page 618. The stain produced corresponds to not more than 0.0025 mg. of As_2O_3 (0.5 part per million).

Heavy metals—Dilute 5 cc. (5 Gm.) with 15 cc. of water and boil gently to remove SO_2. Cool, add a drop of phenolphthalein T.S. and follow with diluted ammonia T.S. until slightly pink. Add 1 cc. of normal hydrochloric acid and dilute with water to 30 cc. The heavy metals limit is 10 parts per million, page 730.

Iron—Evaporate 2 cc. to dryness on a steam bath, add 1 cc. of hydrochloric acid and 5 drops of nitric acid and re-evaporate to dryness on a steam bath. Warm the residue with 2 cc. of hydrochloric acid, dilute with water to 20 cc. and add 2 cc. of ammonium thiocyanate T.S.: any red color produced corresponds to not more than 0.01 mg. of Fe (5 parts per million)

Talc—Use *Talc*, page 550.

Tannic Acid—Use *Tannic Acid*, page 551.

Tartaric Acid, $C_2H_2(OH)_2(COOH)_2$—Use *Tartaric Acid*, page 555.

Tetrachlorobenzoquinone—See *Chloranil*, page 755.

Thioglycollic Acid, $HSCH_2.COOH$—A colorless or nearly colorless liquid, having a strong, unpleasant odor. It is miscible with water, and soluble in alcohol.

Residue on ignition—Cautiously ignite 1 cc. to constant weight. The weight of the residue does not exceed 1 mg. (about 0.1 per cent).

Solubility—One cc. yields a clear and colorless solution with 10 cc. of water.

Sensitiveness—Mix 1 cc. with 2 cc. of stronger ammonia water, and dilute with water to 20 cc. Add 1 cc. of this solution to a mixture of 20 cc. of water, 0.1 cc. of dilute ferric chloride T.S. (1 in 100), then add 5 cc. of ammonia T.S.: a distinct pink color is produced.

Thorium Nitrate, $Th(NO_3)_4$, with a variable amount of water—Colorless or white crystals or granules; slightly deliquescent. Very soluble in water, the solution having a strongly acid reaction

Insoluble—One Gm. dissolves completely, or practically completely, in 10 cc. of water.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.03 mg. of Cl (0.003 per cent), page 729.

Sulfate—Dissolve 500 mg. in a few cc. of water, add 3 cc. of hydrochloric acid, and evaporate to dryness on a water bath. Re-evaporate with 2 cc. of hydrochloric acid and dissolve the residue in 250 cc. of water. Dilute 25 cc. with 10 cc. of water, add 1 cc. of normal hydrochloric acid and 2 cc. of barium chloride T.S. If a turbidity is produced, it corresponds to not more than 0.25 mg. of SO_4 (about 0.5 per cent).

Aluminum—Dissolve 1 Gm. in 100 cc. of water and add 2 cc. of diluted sulfuric acid. Heat the solution to boiling and add 20 cc. of a hot 10 per cent solution of oxalic acid. Allow to cool, and filter. Add ammonia T.S. to the filtrate until slightly alkaline and heat to boiling: no precipitate is formed.

Heavy metals—Dissolve 1 Gm. in 15 cc. of water, add, dropwise, dilute ammonia T.S. until the solution is neutral to litmus paper. Heat to boiling and add diluted hydrochloric acid, dropwise, until the precipitate just dissolves. Cool, dilute to 25 cc., and add 10 cc. of hydrogen sulfide T.S.: no darkening is produced.

Tin, Sn—In the form of almost silver white granules, or irregular fragments.

Lead—Digest 5 Gm. of the metal with 40 cc. of reagent nitric acid on a water bath until the metal is entirely converted into the oxide, then evaporate to dryness. Stir the residue with 5 cc. of nitric acid and 50 cc. of water, and filter. Add to the filtrate 1 cc. of sulfuric acid, evaporate, heat to the production of copious fumes of sulfur trioxide, and cautiously add 10 cc. of water. If an undissolved residue remains, collect it in a Gooch crucible, previously ignited to constant weight, wash with about 10 cc. of cold water (retain filtrate and washings), and ignite gently to constant weight: the weight of the insoluble residue should not exceed 3.5 mg. (0.05 per cent of Pb).

Arsenic—One-fifth of the mixed filtrate and washings from the test for *lead* (corresponding to 1.0 Gm. of the tin) subjected to the arsenic test as outlined on page 618, shows not more than 2 parts per million.

Other metals—To the remainder of the filtrate and washings from the *lead* test, add ammonia T.S. to a slight alkaline reaction, then add 1 or 2 cc. of ammonium sulfide T.S. If a precipitate is produced, collect it in a Gooch crucible, previously washed and ignited to constant weight, wash with water containing some ammonium sulfide and ignite to constant weight: the weight of the residue does not exceed 2.0 mg. (0.05 per cent).

Toluene (*Toluol*), $C_6H_5.CH_3$—A colorless, highly refractive, inflammable liquid. Insoluble in water, miscible with alcohol, ether, chloroform, carbon disulfide, and with petroleum benzin. Specific gravity: about 0.865.

Boiling range—Distil 100 cc. by method II, page 625: not less than 95 cc. distils between 110° and 111°.

Non-volatile—Evaporate 115 cc. on a water bath and dry at 120° for 30 minutes: the weight of the residue should not exceed 2.0 mg. (not more than 0.002 per cent).

Water—Cool the toluene in a dry, tightly stoppered test tube in crushed ice: no cloudiness should be observed. Special care must be taken in handling the toluene before as well as during this test to prevent moisture from being absorbed from the air.

Sulfur compounds—Determine as described under *Benzene*, page 746: the weight of the barium sulfate is not more than 1.2 mg. (0.003 per cent of S).

Substances darkened by sulfuric acid—Shake 15 cc. with 5 cc. of reagent sulfuric acid for from 15 to 20 seconds and allow to stand 15 minutes. The toluene layer should be colorless and the color of the acid should not exceed that of a mixture of 2 volumes of water and 1 volume of a color standard containing 5 Gm. of $CoCl_2.6H_2O$, 40 Gm. of $FeCl_3.6H_2O$, and 20 cc. of hydrochloric acid in 1000 cc.

Trichloroacetic Acid—Use *Trichloroacetic Acid*, page 588.

Triketohydrindene Hydrate, $C_9H_4O_3.H_2O$—White to brownish white crystals or crystalline powder. Soluble in water and in alcohol; slightly soluble in ether and in chloroform. When heated above 100°, it becomes red. Keep protected from light.

Melting range—When determined in a bath preheated at 220°, it melts with decomposition between 240° and 245°.

Residue on ignition—Negligible from 100 mg.

Sensitiveness—Prepare a solution of 10 mg. of aminoacetic acid in 25 cc. of water. To 1 cc. of this solution add a solution of 50 mg. of sodium acetate in 2 cc. of water, then add 0.2 cc. of a solution of 5 mg. of triketohydrindene hydrate in 1 cc. of water, and boil the mixture for 1 to 2 minutes: a violet color is produced which becomes intense on standing a few minutes.

Trinitrophenol (*Picric Acid*) $HOC_6H_2(NO_2)_3$—Yellow prisms or scales, odorless and having an intensely bitter taste; soluble in water, alcohol, chloroform, and ether.

Caution—Trinitrophenol explodes when heated rapidly or when subjected to percussion. For safety in transportation, trinitrophenol is usually mixed with from 10 to 20 per cent of water. Before applying the following tests, dry the trinitrophenol to constant weight over sulfuric acid.

Melting range—121° to 123°.

Sulfate—Add 5 drops of barium chloride T.S. to 10 cc. of a solution (1 in 100): the liquid does not at once become opalescent.

Insoluble in benzene—Dissolve 2 Gm. in 50 cc. of benzene, collect the insoluble residue, if any, on a tared filter which has been dried at 100° and weighed, and wash the residue and filter with benzene until the last washing is colorless: the residue, dried at 100°, does not exceed 4 mg. (0.2 per cent).

***l*-Tryptophane,** $C_{11}H_{12}N_2O_2$—White or not more than slightly yellow leaflets or powder. One Gm. dissolves in about 100 cc. of water; slightly soluble in alcohol; soluble in dilute acids and in solutions of the alkali hydroxides.

Specific rotation, $[\alpha]_D^{25}$—Determined in a solution containing the equivalent of 1 Gm. in each 100 cc. and using a 200-mm. tube, it is between −31° and −33°.

Residue on ignition—Not more than 0.1 per cent.

Chloride—The chloride from 200 mg. corresponds to not more than 0.1 mg. of Cl (0.05 per cent), page 729.

Sulfate—The sulfate from 200 mg. corresponds to not more than 0.1 mg. of SO_4 (0.05 per cent), page 729.

Ammonium salts—Dissolve 500 mg. in 70 cc. of water, add 1 Gm. of magnesium oxide, and distil 40 cc. into 2 cc. of tenth-normal hydrochloric acid. Add to the distillate 2 cc. of 10 per cent sodium hydroxide solution and 2 cc. of Nessler's reagent:

any color produced should not exceed that of a blank run in the same manner with a quantity of ammonium chloride equivalent to 0.15 mg. of NH_3 (0.03 per cent NH_3).

Tyrosine—Dissolve 100 mg. in 3 cc. of diluted sulfuric acid, add 10 cc. of mercuric sulfate T.S., and heat on a steam bath for 10 minutes. Filter, wash with 5 cc. of mercuric sulfate T.S., and add to the combined filtrate 0.5 cc. of 5 per cent sodium nitrite solution: no red color is produced in 15 minutes.

Nitrogen—When determined in a sample previously dried for 3 hours at 100°, not less than 13.4 per cent and not more than 13.9 per cent is found.

Uracil, $C_4H_4N_2O_2$—White to cream-colored, crystalline powder. Melts above 300°. One Gm. dissolves in about 500 cc. of water; less soluble in alcohol; soluble in ammonia T.S. and in sodium hydroxide T.S. Its solution yields no precipitate with the usual alkaloidal precipitants.

Residue on ignition—Negligible from 100 mg.

Loss on drying—At 110°, not more than 2 per cent.

Uranyl Acetate (*Uranium Acetate*), $UO_2(C_2H_3O_2)_2.2H_2O$—Yellow, crystalline powder, having a slight odor of acetic acid. Soluble in water, usually requiring the addition of a little acetic acid to effect complete solution.

Insoluble—The insoluble matter from 5 Gm. dissolved in 100 cc. of cold water is not more than 1.0 mg. (0.02 per cent), page 729.

Chloride—The chloride in 1 Gm. corresponds to not more than 0.15 mg. of Cl (0.015 per cent), page 729.

Sulfate—The sulfate in 1 Gm. corresponds to not more than 0.2 mg. of SO_4 (0.02 per cent), page 729.

Alkali and alkaline earths—Ignite 2 Gm. until thoroughly decomposed. Powder the residue and boil for 10 minutes with 50 cc. of water. Cool, dilute to 50 cc., mix well, and filter. To 25 cc. of the filtrate add a few drops of reagent sulfuric acid, evaporate to dryness, and ignite to constant weight: the weight of the residue should not exceed 1.0 mg. (0.1 per cent as sulfate).

Heavy metals—Dissolve 2 Gm. in 30 cc. of water, add 1 cc. of normal hydrochloric acid, and divide into two equal portions. To one portion add 5 cc. of hydrogen sulfide T.S. and to the other portion add 5 cc. of water. The portion treated with hydrogen sulfide shows no appreciable darkening when compared with the other portion.

Uranous compounds—Dissolve 2 Gm. of the salt in 50 cc. of water, add 2 cc. of reagent sulfuric acid, and divide the solution into two equal parts. Add to one part tenth-normal potassium permanganate until a change in color is produced by comparison with the other part. Not more than 0.3 cc. of the potassium permanganate solution is required to produce the change.

Urea—Use *Urea*, page 595.

Water for Injection—Use *Water for Injection*, page 601.

Water-Soluble Yeast Extract—A peptone-like substance which represents the soluble product of yeast cells (saccharomyces) prepared under optimum conditions, clarified and dried to a powder. One Gm. of the Extract represents not less than 7.5 Gm. of yeast. Water-Soluble Yeast Extract is a reddish yellow to brown powder, with a characteristic but not putrescent odor. It is soluble in water, forming a yel-

low to brown solution, having a slightly acid reaction. It contains no added carbohydrate.

Nitrogen content—Determine the nitrogen content of the extract, previously dried to constant weight at 100°, by the Kjeldahl method, page 671. Not less than 7.2 and not more than 9.5 per cent of nitrogen (N) is found.

Loss on drying—Weigh accurately about 1 Gm. and dry to constant weight at 100°: the loss in weight corresponds to not more than 5 per cent.

Residue on ignition—Weigh accurately about 500 mg. and heat slowly until thoroughly charred. Cool, add 1 cc. of sulfuric acid, and ignite to constant weight: the weight of the residue corresponds to not more than 15 per cent.

Coagulable protein—Heat a filtered solution of the Extract (1 in 20) to boiling: no precipitate forms.

Chloride—The chloride content, calculated as sodium chloride, does not exceed 5.0 per cent.

Xanthine, $C_5H_4N_4O_2$—White, crystalline powder. Decomposes on heating. Slightly soluble in water and in alcohol; sparingly soluble in diluted hydrochloric acid but soluble in sodium hydroxide T.S. When subjected to the murexide reaction, a purple color is produced with the ammonia, but on the subsequent addition of fixed alkali hydroxides, the color is not discharged but is changed to violet.

Residue on ignition—Negligible from 100 mg.

Loss on drying—At 110°, not more than 1 per cent.

Xylene, C_8H_{10}—A colorless, transparent liquid, insoluble in water, very soluble in alcohol and in ether. Specific gravity: 0.85.

Boiling range—Distil 100 cc. by method II, page 625: not less than 95 cc. distils between 137° and 140°.

Non-volatile—Evaporate 60 cc. on a water bath and dry at 110° for 1 hour: the weight of the residue should not exceed 1.0 mg. (0.002 per cent).

Water—It meets the requirements for this test under *Toluene*, page 829.

Sulfur compounds—Determine as described under *Benzene*, page 746: the weight of the barium sulfate does not exceed 1.2 mg. (0.003 per cent of S).

Substances darkened by sulfuric acid—Shake 15 cc. with 5 cc. of sulfuric acid for from 15 to 20 seconds and allow to stand for 15 minutes. The xylene layer should be colorless, and the color of the acid should not exceed that of a mixture of 1 volume of water and 3 volumes of a color standard containing 5 Gm. of $CoCl_2.6H_2O$, 40 Gm. of $FeCl_3.6H_2O$, and 20 cc. of hydrochloric acid in 1000 cc.

Yeast, Dried—Use *Dried Yeast*, page 606.

Zinc, Zn—Globules, irregular fragments, granules, or as a fine powder known as *Zinc Dust*. The tests described below are not required for the fine powder.

Arsenic—Test 12 Gm. by the method described on page 618, using 12 cc. of reagent sulfuric acid, diluted with about 70 cc. of water: any stain produced is not greater than that produced in a control made with 0.003 mg. of As_2O_3, 2 Gm. of the Zinc, and the same quantities of the acid and water (0.3 part per million).

Iron (substances oxidized by permanganate as Fe)—Heat 10 Gm. with a mixture of 15 cc. of sulfuric acid and 100 cc. of water in a flask provided with a rubber valve. When the zinc has dissolved, titrate the solution with tenth-normal potas-

sium permanganate: not more than 0.3 cc. should be required to produce a pink color, correcting for the blank test and end-point (0.017 per cent as Fe).

Insoluble in sulfuric acid—If an insoluble residue remains when the zinc is dissolved in the test for *iron*, filter the solution, after titration with permanganate, wash the residue with hot water, and dry it at from 105° to 110°: its weight should not exceed 50.0 mg. (0.50 per cent).

Zinc Chloride, $ZnCl_2$—A white or nearly white, crystalline powder or granules, or pencils; very hygroscopic and deliquescent. One Gm. dissolves in about 0.5 cc. of water, in about 1.5 cc. of alcohol; it is also soluble in glycerin. Its solution in water or alcohol is usually turbid, but the turbidity disappears upon the addition of a small quantity of hydrochloric acid.

Oxychloride and insoluble—Add 5 Gm. to a mixture of 2 cc. of normal hydrochloric acid and 40 cc. of water, and stir until dissolved: the resulting solution is complete and clear.

Sulfate—Dissolve 2 Gm. in 20 cc. of water and 1 cc. of normal hydrochloric acid, and add 2 cc. of barium chloride T.S. Any turbidity produced corresponds to not more than 0.2 mg. of SO_4, page 729 (0.01 per cent).

Alkali and alkaline earths—Dissolve 2 Gm. in 140 cc. of water, add 10 cc. of ammonia T.S., and completely precipitate the zinc with hydrogen sulfide. Filter, and to 75 cc. of the filtrate add 5 drops of sulfuric acid, evaporate, and ignite: not more than 2 mg. of residue remains (0.2 per cent).

Ammonia—Dissolve 1 Gm. in 30 cc. of water, and add sufficient sodium hydroxide solution (1 in 10) to redissolve the precipitate first formed, then dilute with water to 50 cc., and add 2 cc. of Nessler's reagent. If any color is produced, it is not darker than that produced by treating 0.15 mg. of ammonium chloride in the same manner as the zinc chloride (0.005 per cent NH_3).

Iron—Dissolve 1 Gm. in 10 cc. of water, add 2 drops of nitric acid, bring to a boil, and cool. Add to the solution 1 cc. of hydrochloric acid and 2 cc. of ammonium thiocyanate solution (1 in 10): any red color produced is not greater than that produced in a blank to which 0.01 mg. of iron has been added (0.001 per cent Fe).

Lead—Dissolve 1 Gm. in 10 cc. water with the aid of a drop of hydrochloric acid, and dilute to 20 cc. To 5 cc. of the solution add 2.5 cc. of standard lead solution, page 657, and 25 cc. of potassium cyanide solution (1 in 7), and dilute with water to 40 cc. (A). To the remaining 15 cc. of the solution add 25 cc. of the potassium cyanide solution (B). Then to each add 10 cc. of hydrogen sulfide T.S. B is no darker than A (50 parts per million).

Zinc Oxide—Use *Zinc Oxide*, page 609.

Zinc Sulfate, $ZnSO_4$—Use *Zinc Sulfate*, page 612.

Test Solutions (T.S.)

For the preparation of Test Solutions, reagents of the quality described under Reagents, pages 731 to 833, are to be used.

Wherever possible and desirable, the concentrations of the following test solutions have been adjusted approximately to a normality basis.

Albumen Test Solution—Carefully separate the white from the yolk of a strictly fresh hen's egg. Shake the white with 100 cc. of water until thoroughly mixed and all

but the chalaza has undergone solution; filter. Prepare the solution freshly.

Alcohol-Phenol Test Solution—Dissolve 780 mg. of phenol in sufficient alcohol to make 100 cc.

Alkaline Cupric Iodide Test Solution—Dissolve 7.5 Gm. of cupric sulfate ($CuSO_4.5H_2O$) in about 100 cc. of water. In a separate container dissolve 25 Gm. of anhydrous sodium carbonate, 20 Gm. of sodium bicarbonate, and 25 Gm. of potassium and sodium tartrate in about 600 cc. of water. With constant stirring add the cupric sulfate solution to the bottom of the alkaline tartrate solution by means of a funnel which touches the bottom of the container. Add 1.5 Gm. of potassium iodide, 200 Gm. of anhydrous sodium sulfate, 50 to 150 cc. of sixtieth-molar potassium iodate, and sufficient water to make 1000 cc. (The amount of iodate solution required depends on the blood-sugar concentration and the volume of blood filtrate used.)

Alkaline Cupric Tartrate Test Solution (*Fehling's Solution*)—*A—The Copper Solution*—Dissolve 34.66 Gm. of carefully selected, small crystals of cupric sulfate, showing no trace of efflorescence or of adhering moisture, in sufficient water to make 500 cc. Keep this solution in small, well-stoppered bottles.

B—The Alkaline Tartrate Solution—Dissolve 173 Gm. of crystallized potassium and sodium tartrate and 50 Gm. of sodium hydroxide in sufficient water to make 500 cc. Keep the solution in small, rubber-stoppered bottles.

For use, mix exactly equal volumes of the two solutions at the time required.

Ammonia-Cyanide Test Solution—Dissolve 2 Gm. of potassium cyanide in 15 cc. of stronger ammonia T.S., and dilute to 100 cc. with water.

Ammonia Test Solution—It contains not less than 9.5 per cent and not more than 10.5 per cent of NH_3. It is prepared by diluting 400 cc. of *Stronger Reagent Ammonia Water*, page 735, with sufficient water to make 1000 cc.

Ammonia Test Solution, Alcoholic—A solution of ammonia gas in alcohol. A clear, colorless liquid having a strong odor of ammonia. Specific gravity, about 0.80. When assayed by the method directed under *Diluted Ammonia Solution* it shows not less than 9 per cent and not more than 11 per cent by weight of NH_3. Preserve in rubber-stoppered or greased glass-stoppered bottles in a cool place.

Ammonia Test Solution, Stronger—Use *Stronger Reagent Ammonia Water*, page 735.

Ammonium Acetate Test Solution—Dissolve 10 Gm. of ammonium acetate in sufficient water to make 100 cc.

Ammonium Carbonate Test Solution—Dissolve 20 Gm. of ammonium carbonate and 20 cc. of ammonia T.S. in sufficient water to make 100 cc.

Ammonium Chloride Test Solution (2 N.)—Dissolve 10.5 Gm. of ammonium chloride in sufficient water to make 100 cc.

Ammonium Chloride-Ammonium Hydroxide Test Solution—Mix equal volumes of water and stronger ammonia T.S., and saturate with ammonium chloride.

Ammonium Molybdate Test Solution—Dissolve 6.5 Gm. of finely powdered molybdic acid in a mixture of 14 cc. of water and 14.5 cc. of stronger ammonia T.S. Cool the solution and add it slowly, with stirring, to a well-cooled mixture of 32 cc. of nitric acid, and 40 cc. of water. Allow to stand for 48 hours and filter through asbestos. This solution deteriorates upon standing. If, upon the addition of 2 cc. of sodium phosphate T.S. to 5 cc. of the solution, an abundant yellow precipitate does not form at once or after slight warming, the solution should not be used. Preserve in the dark; if a precipitate forms, use only the clear, decanted solution.

Ammonium Oxalate Test Solution (0.5 N.)—Dissolve 3.5 Gm. of ammonium oxalate in sufficient water to make 100 cc.

Ammonium Phosphate, Dibasic, Test Solution (1 N.) (*Ammonium Phosphate Test Solution*)—Dissolve 13 Gm. of dibasic ammonium phosphate in sufficient water to make 100 cc.

Ammonium Polysulfide Test Solution—A yellow liquid, made by saturating ammonium sulfide T.S. with sulfur.

Ammonium Sulfide Test Solution—Saturate ammonia T.S. with hydrogen sulfide and add two-thirds of its volume of ammonia T.S. Residue upon ignition, not over 0.05 per cent. The solution is not rendered turbid either by magnesium sulfate T.S. or by calcium chloride T.S. (*carbonate*).

This solution must not be used if an abundant precipitate of sulfur is present. Preserve in small, well-filled, dark amber-colored bottles, in a cool, dark place.

Ammonium Thiocyanate Test Solution (approximately 1 N.)—Dissolve 8 Gm. of ammonium thiocyanate in sufficient water to make 100 cc.

Aniline Sulfate Test Solution—Dissolve 5 Gm. of aniline sulfate in 25 cc. of alcohol, and add sufficient water to make 100 cc.

Barfoed's Reagent—See *Cupric Acetate Test Solution, Stronger*, page 836.

Barium Chloride Test Solution (1 N.)—Dissolve 12 Gm. of barium chloride in sufficient water to make 100 cc.

Barium Hydroxide Test Solution (0.5 N.)—A saturated solution of barium hydroxide in recently boiled water. This test solution must be freshly prepared.

Barium Nitrate Test Solution (0.5 N.)—Dissolve 6.5 Gm. of barium nitrate in sufficient water to make 100 cc.

Bromine Test Solution (*Bromine Water*)—A saturated solution of bromine, prepared by agitating from 2 to 3 cc. of bromine with 100 cc. of cold water in a glass-stoppered bottle, the stopper of which should be lubricated with petrolatum. Preserve in a cool place, protected from light.

Calcium Chloride Test Solution (1 N.)—Dissolve 7.5 Gm. of calcium chloride in sufficient water to make 100 cc.

Calcium Hydroxide Test Solution (0.04 N.)—Use *Calcium Hydroxide Solution*, page 97.

Calcium Sulfate Test Solution—A saturated solution of calcium sulfate in water.

Chloral Hydrate Test Solution—Dissolve 50 Gm. of chloral hydrate in 15 cc. of water and 10 cc. of glycerin.

Chlorine Test Solution (*Chlorine Water*)—A saturated solution of chlorine in water. The solution should be kept in small, dark amber-colored, glass-stoppered bottles, which should be completely filled. Chlorine T.S, even when kept from light and air, is apt to deteriorate. When full strength is required, it must be freshly prepared. Preserve in a dark, cool place.

Chloro-Zinc Iodide Test Solution—Dissolve 1 Gm. of potassium iodide in 10 cc. of water, then dissolve in the solution 2 Gm. of zinc chloride, dilute with water to 100 cc., and filter, if necessary. Preserve the solution in a cool place, in light-resistant containers.

Chromotropic Acid Test Solution—Dissolve 50 mg. of chromotropic acid or its sodium salt in 100 cc. of 75 per cent sulfuric acid. (This acid may be made by cautiously adding 90 cc. of sulfuric acid to 40 cc. of water.)

Cobaltous Chloride Test Solution (0.16 N.)—Dissolve 2 Gm. of cobaltous chloride in 1 cc. of hydrochloric acid and sufficient water to make 100 cc.

Cobalt-Uranyl Acetate Test Solution—*Solution I*—Add 40 Gm. of uranyl acetate to 30 Gm. of glacial acetic acid and add sufficient water to make the solution measure 500 cc. *Solution II*—Add 200 Gm. of cobaltous acetate to 30 Gm. of glacial acetic acid and sufficient water to make the solution measure 500 cc.

Heat the separate solutions at a temperature of about 75° until the salts have dissolved, then mix the two solutions and cool to 20°. Maintain the temperature at this point for about 2 hours to separate the excess salts from solution and then filter through a dry filter.

Congo Red Test Solution—Dissolve 500 mg. of congo red in a mixture of 10 cc. of alcohol and 90 cc. of water.

Cupric Acetate Test Solution—Dissolve 100 mg. of cupric acetate in about 5 cc. of water to which a few drops of acetic acid have been added. Dilute to 100 cc. and filter if necessary.

Cupric Acetate Test Solution, Stronger (*Barfoed's Reagent*)—Dissolve 13.3 Gm. of cupric acetate in a mixture of 195 cc. of water and 5 cc. of acetic acid.

Cupric-Ammonium Sulfate Test Solution—To cupric sulfate T.S. add ammonia T.S., drop by drop, until the precipitate at first formed is nearly but not completely dissolved. Allow to settle and decant the clear solution. This solution must be freshly prepared.

Cupric Oxide, Ammoniated, Test Solution (*Schweitzer's Reagent*)—Dissolve 10 Gm. of cupric sulfate in 100 cc. of water, add sufficient 20 per cent sodium hydroxide

solution to precipitate the copper hydroxide, collect the latter on a filter, and wash free from sulfate with cold water. Dissolve the precipitate, which must be kept wet during the entire process, in the minimum quantity of ammonia T.S. necessary for complete solution.

Cupric Sulfate Test Solution (1 N.)—Dissolve 12.5 Gm. of cupric sulfate in sufficient water to make 100 cc.

Delafield's Hematoxylin Test Solution—*Solution A*—Prepare 400 cc. of a saturated solution of ammonium alum. *Solution B*—Dissolve 4 Gm. of hematoxylin in 25 cc. of alcohol, mix it with Solution A, allow it to stand for 4 days, in a flask closed with a pledget of purified cotton, and exposed to light and air. Then filter and add to it Solution C, consisting of a mixture of 100 cc. of glycerin and 100 cc. of methanol. Mix thoroughly and allow the mixture to stand in a warm place, exposed to light, for 6 weeks until it becomes dark colored. Keep the solution in a tightly stoppered bottle.

Denigès' Reagent—See *Mercuric Sulfate T.S.*, page 840.

Diazobenzene-Sulfonic Acid Test Solution—Dry about 2 Gm. of sulfanilic acid for 3 hours at 110°. Weigh 1.57 Gm. of the dried acid, place it in a beaker, add 80 cc. of water and 10 cc. of diluted hydrochloric acid, and warm on a steam bath until dissolved. Cool to 15° (some of the sulfanilic acid may separate but will be dissolved later) and add slowly, and with constant stirring, 6.5 cc. of a 10 per cent solution of sodium nitrite; then dilute with water to 100 cc.

Diazotized *p*-Aminoacetophenone Test Solution—(*a*) Dissolve 1.27 Gm. of *p*-aminoacetophenone in 18 cc. of hydrochloric acid, add sufficient water to make 200 cc., and mix well. Store the solution in amber bottles and protect from direct sunlight.

(*b*) Dissolve 9 Gm. of sodium nitrite in sufficient water to make 200 cc., and mix well. When not in use, keep the solution in a refrigerator.

(*c*) Dissolve 4 Gm. of sodium hydroxide in 150 cc. of water, add 5.76 Gm. of sodium bicarbonate, then add sufficient water to make 200 cc., and mix well.

(*d*) Place a suitable volume of (*a*) in a beaker surrounded with ice and provided with a stirrer. Add an equal volume of (*b*) and stir the mixture for 10 minutes. At the end of this period add 4 volumes of (*b*) and stir for 30 minutes maintaining the mixture at a temperature not above 5°. This solution should be used within 2 days of its preparation, and when not in use it should be kept in a refrigerator.

The test solution is made by adding 10 cc. of (*d*) to 137 cc. of (*c*) and stirring until the purple color first produced disappears. This will usually take place in 5 to 10 minutes. Prepare the test solution immediately before use.

***p*-Dimethylamino-benzaldehyde Test Solution**—Dissolve 125 mg. of *p*-dimethylaminobenzaldehyde in a cooled mixture of 65 cc. of sulfuric acid and 35 cc. of water, and add 0.05 cc. of ferric chloride T.S. This solution must not be used if it has been prepared longer than 7 days.

2,4-Dinitrophenylhydrazine Test Solution—Dissolve 1.5 Gm. of 2,4-dinitrophenylhydrazine in a cooled mixture of 10 cc. of sulfuric acid and 10 cc. of water. Add

enough of a mixture of 1 volume of aldehyde-free alcohol and 3 volumes of water to make the volume of the solution 100 cc., and filter if necessary.

Diphenylamine Test Solution—Dissolve 1.0 Gm. of diphenylamine in 100 cc. of sulfuric acid. The solution should be colorless.

Fehling's Solution—See *Alkaline Cupric Tartrate T.S.*, page 834.

Ferric Chloride Test Solution (1 N.)—Dissolve 9 Gm. of ferric chloride in sufficient water to make 100 cc.

Ferrous Sulfate Test Solution—Dissolve 8 Gm. of clear crystals of ferrous sulfate in about 100 cc. of recently boiled and thoroughly cooled water. This solution must be freshly prepared.

Ferrous Sulfate Test Solution, Acid (0.25 N.)—Dissolve 7 Gm. of ferrous sulfate crystals in 90 cc. of recently boiled and thoroughly cooled water, and add sufficient sulfuric acid to make 100 cc. This solution must not be kept for long periods of time.

Formaldehyde Test Solution—Use *Formaldehyde Solution*, page 225.

Fuchsin-Sulfurous Acid Test Solution—Dissolve 200 mg. of basic fuchsin in 120 cc. of hot water and allow the solution to cool. Add a solution of 2 Gm. of anhydrous sodium sulfite in 20 cc. of water and follow by 2 cc. of hydrochloric acid. Dilute the solution with water to 200 cc. and allow to stand at least 1 hour. This solution must be freshly prepared.

Gelatin Test Solution—Dissolve 1 Gm. of gelatin in 50 cc. of water with the aid of gentle heat, and filter, if necessary. This solution must be freshly prepared.

Gold Chloride Test Solution (0.2 N.)—Dissolve 1 Gm. of reagent gold chloride in 35 cc. of water.

Hydrogen Peroxide Test Solution—Use *Hydrogen Peroxide Solution*, page 260.

Hydrogen Sulfide Test Solution—A saturated solution of hydrogen sulfide, made by passing H_2S into cold water. Keep the solution in small, dark amber-colored bottles, filled nearly to the top. Do not use it unless it possesses a strong odor of H_2S, and unless it produces at once a copious precipitate of sulfur when added to an equal volume of ferric chloride T.S. Preserve in a cool, dark place.

Hydroxylamine Hydrochloride Test Solution—Dissolve 3.5 Gm. of hydroxylamine hydrochloride in 95 cc. of 60 per cent alcohol, add 0.5 cc. of a 0.1 per cent solution of bromophenol blue and half-normal alcoholic potassium hydroxide until a greenish tint develops in the solution. Then add sufficient 60 per cent alcohol to make the solution measure 100 cc.

8-Hydroxyquinoline Test Solution—Dissolve 5 Gm. of 8-hydroxyquinoline in sufficient alcohol to make 100 cc.

Hypophosphorous Acid Test Solution—Use *Hypophosphorous Acid*, page 263.

Indigo Carmine Test Solution—Dissolve a quantity of indigo carmine, equivalent to 180 mg. of $C_{16}H_8N_2O_2(SO_3Na)_2$, in sufficient water to make 100 cc. This solution should not be used after 60 days from the time of its preparation.

Iodine Test Solution—Use *Tenth-normal Iodine*, page 856.

Iodine and Potassium Iodide Test Solution—Dissolve 500 mg. of iodine and 1.5 Gm. of potassium iodide in 25 cc. of water.

Iodobromide Test Solution—Dissolve 13.2 Gm. of reagent iodine in 1000 cc. of glacial acetic acid with the aid of gentle heat, if necessary. Cool the solution to 25° and determine the iodine content in 20 cc. by titration with tenth-normal sodium thiosulfate. Add to the remainder of the solution a quantity of bromine equivalent to that of the iodine present. Preserve in glass-stoppered bottles, protected from light.

Lead Acetate Test Paper—Immerse strips of heavy white filter paper, 6 mm. in width and 8 cm. in length, in lead acetate T.S.; drain off the excess liquid and dry the paper on glass in an oven at 100°, avoiding contact with metal.

Lead Acetate Test Solution (0.5 N.)—Dissolve 9.5 Gm. of clear, transparent crystals of lead acetate, in sufficient recently boiled water to make 100 cc. Preserve in well-stoppered bottles.

Lead Acetate Test Solution, Alcoholic (0.1 N.)—Dissolve 2 Gm. of clear, transparent crystals of lead acetate in sufficient alcohol to measure 100 cc. Preserve in well-stoppered bottles.

Lead Subacetate Test Solution—Triturate 14 Gm. of lead monoxide to a smooth paste with 10 cc. of water, transfer the mixture to a bottle, using an additional 10 cc. of water for rinsing. Dissolve 22 Gm. of lead acetate in 70 cc. of water and add the solution to the lead oxide mixture. Shake it vigorously for 5 minutes, then set it aside, shaking it frequently, during 7 days. Finally, filter and add enough recently boiled water through the filter to make the product measure 100 cc.

Lead Subacetate Test Solution, Diluted—Dilute 4 Gm. of lead subacetate T.S. with sufficient water, recently boiled and cooled, to make the product weigh 100 Gm. Preserve in small, well-filled and tightly stoppered bottles.

Locke-Ringer's Solution

Reagent Sodium Chloride	9	Gm.
Reagent Potassium Chloride	0.42	Gm.
Reagent Calcium Chloride	0.24	Gm.
Reagent Magnesium Chloride	0.2	Gm.
Sodium Bicarbonate	0.5	Gm.
Dextrose	0.5	Gm.
Water, recently distilled from a hard glass flask, a sufficient quantity,		
To make	1000	cc.

The solution must be freshly made each day. The constituents (except the dextrose and the sodium bicarbonate) may be made up in a more concentrated stock solution and diluted as needed.

Magnesia Mixture Test Solution—Dissolve 5.5 Gm. of magnesium chloride and 7 Gm. of reagent ammonium chloride in 65 cc. of water, add 35 cc. of ammonia T.S.,

set the mixture aside for a few days in a well-stoppered bottle, and filter. If the solution is not perfectly clear, filter it before using.

Magnesium Sulfate Test Solution (1 N.)—Dissolve 12 Gm. of uneffloresced crystals of magnesium sulfate in sufficient water to make 100 cc.

Mallory's Stain—Dissolve 500 mg. of water-soluble aniline blue, 2 Gm. of orange G, and 2 Gm. of oxalic acid in 100 cc. of water.

Manganese Sulfate Test Solution (1 N.)—Dissolve 11 Gm. of manganese sulfate in 50 cc. of water and add sufficient diluted sulfuric acid to make 100 cc.

Mayer's Reagent—See *Mercuric-Potassium Iodide T.S.*, page 840.

Mercuric Bromide Test Paper—Cut stiff, heavy quantitative filter paper (see *Filter Paper, Quantitative*, page 766) into strips 2.5 mm. in width and about 12 cm. in length. Immerse these strips for 1 hour in alcoholic mercuric bromide T.S. Remove from solution without touching that portion of the strip which is to be used to form the stain. Allow the alcohol to evaporate spontaneously while the strips are suspended from glass rods. Place them at once in a glass-stoppered, wide-mouthed bottle, and protect from light.

Mercuric Bromide Test Solution, Alcoholic (0.3 N.)—Dissolve 5 Gm. of mercuric bromide in 100 cc. of alcohol, employing gentle heat to facilitate solution. Preserve in glass-stoppered bottles, and protect from light.

Mercuric Iodide Test Solution (*Valser's Reagent*)—Slowly add a 10 per cent solution of potassium iodide to red mercuric iodide until almost all of the red mercuric iodide is dissolved. Remove the excess mercuric iodide by filtration. A solution containing 10 Gm. of potassium iodide in 100 cc. dissolves approximately 14 Gm. of HgI_2 at 20°.

Mercuric Nitrate Test Solution (4 N.)—Dissolve 40 Gm. of mercuric oxide (red or yellow) in a mixture of 32 cc. of nitric acid and 15 cc. of water. Preserve in glass-stoppered bottles, protected from light.

Mercuric-Potassium Iodide Test Solution (*Mayer's Reagent*)—Dissolve 1.358 Gm. of mercury bichloride in 60 cc. of water. Dissolve 5 Gm. of potassium iodide in 10 cc. of water. Mix the two solutions and add sufficient water to make 100 cc.

Mercuric-Potassium Iodide Test Solution, Alkaline (*Nessler's Reagent*)—Dissolve 10 Gm. of potassium iodide in 10 cc. of water, and add slowly, with stirring, a saturated solution of mercury bichloride until a slight red precipitate remains undissolved. To this mixture add 30 Gm. of potassium hydroxide. After solution has taken place, add 1 cc. more of the saturated solution of mercury bichloride. Dilute with water to 200 cc. Allow the precipitate to settle and draw off the clear liquid. A 2-cc. portion of this reagent, when added to 50 cc. of water containing 0.05 mg. of ammonia, produces at once a yellowish brown coloration.

Mercuric Sulfate Test Solution (*Denigès' Reagent*)—Mix 5 Gm. of yellow mercuric oxide with 40 cc. of water and while stirring slowly add 20 cc. of sulfuric acid, then add another 40 cc. of water and stir until completely dissolved.

Mercurous Nitrate Test Solution (0.5 N.)—Dissolve 15 Gm. of mercurous nitrate in a mixture of 90 cc. of water and 10 cc. of diluted nitric acid. Preserve in a dark, amber-colored bottle in which a small globule of mercury has been placed.

Mercury Bichloride Test Solution (0.5 N.)—Dissolve 6.5 Gm. of mercury bichloride in sufficient water to make 100 cc.

Metaphenylenediamine Hydrochloride Test Solution—Dissolve 1 Gm. of metaphenylenediamine hydrochloride in 200 cc. of water: the solution must be colorless when used. If necessary, decolorize by heating with activated charcoal.

Methylene Blue Perchlorate Test Solution—To 500 cc. of a solution of potassium perchlorate (1 in 1000) add, drop by drop, with constant shaking, a solution of methylene blue (1 in 100) until a slight permanent turbidity results. Allow the precipitate to settle and filter the supernatant liquid through paper.

Molybdo-Phosphotungstate Test Solution (*Folin-Denis Reagent*)—To about 350 cc. of water contained in a round-bottom flask, add 50 Gm. of sodium tungstate, 12 Gm. of phosphomolybdic acid and 25 cc. of phosphoric acid. Boil the mixture under a reflux condenser for 2 hours, then cool, dilute with water to 500 cc. and mix well. Keep the solution tightly closed, protected from light, and in a cool place.

β-Naphthylamine Acetate Test Solution—Dissolve 500 mg. of β-naphthylamine acetate in 100 cc. of acetic acid and filter quickly through purified cotton. Preserve in well-stoppered bottles, protected from light.

Nessler's Reagent—Use *Mercuric-Potassium Iodide T.S., Alkaline*, page 840.

Oxalic Acid Test Solution (1 N.)—Dissolve 6.3 Gm. of oxalic acid in sufficient water to measure 100 cc.

Palladous Chloride Test Solution—Dissolve 500 mg. of palladous chloride in sufficient water to measure 10 cc. Preserve in glass-stoppered bottles.

Phenoldisulfonic Acid Test Solution—Dissolve 2.5 Gm. of phenol in 15 cc. of sulfuric acid in a flask of suitable capacity. Add 7.5 cc. of fuming sulfuric acid, stir well, and heat for 2 hours at 100°. Transfer the product, while still fluid, to a glass-stoppered bottle, and, when desired for use, warm in a water bath until liquefied.

Phenolsulfonphthalein Test Solution—Dissolve 1 Gm. of phenolsulfonphthalein in sufficient alcohol to make 100 cc.

Phenylhydrazine Acetate Test Solution—Dissolve 10 cc. of phenylhydrazine and 5 cc. of glacial acetic acid in sufficient water to make 100 cc.

Phloroglucinol Test Solution—Dissolve 500 mg. of phloroglucinol in 25 cc. of alcohol. Preserve in a tightly stoppered bottle, protected from light.

Phosphotungstic Acid Test Solution—Dissolve 1 Gm of phosphotungstic acid in sufficient water to make 100 cc.

Picric Acid Test Solution—See *Trinitrophenol Test Solution*, page 844.

Platinic Chloride Test Solution (0.5 N.)—Dissolve 2.6 Gm. of platinic chloride in sufficient water to make 20 cc.

Potassium Acetate Test Solution (1 N.)—Dissolve 10 Gm. of potassium acetate in sufficient water to make 100 cc.

Potassium Carbonate Test Solution (1 N.)—Dissolve 7 Gm. of reagent anhydrous potassium carbonate in sufficient water to make 100 cc.

Potassium Dichromate Test Solution (1 N.)—(Based on the basicity of CrO_3)—Dissolve 7.5 Gm. of potassium dichromate in sufficient water to make 100 cc.

Potassium Ferricyanide Test Solution (1 N.)—Dissolve 1 Gm. of potassium ferricyanide in 10 cc. of water. This test solution must be freshly prepared.

Potassium Ferrocyanide Test Solution (1 N.)—Dissolve 1 Gm. of potassium ferrocyanide in 10 cc. of water. The solution must be freshly prepared.

Potassium Hydroxide Test Solution (1 N.)—Dissolve 6.5 Gm. of potassium hydroxide in sufficient water to make 100 cc.

Potassium Hydroxide Test Solution, Alcoholic—Use *Half-normal Alcoholic Potassium Hydroxide*, page 859.

Potassium Iodide Test Solution (1 N.)—Dissolve 16.5 Gm. of potassium iodide in sufficient water to make 100 cc. Preserve in amber-colored bottles.

Potassium Permanganate Test Solution—Use *Tenth-normal Potassium Permanganate*, page 861.

Potassium Sulfate Test Solution—Dissolve 1 Gm. of potassium sulfate in sufficient water to make 100 cc.

Pyrogallol Test Solution, Alkaline—Dissolve 500 mg. of pyrogallol in 2 cc. of water. Dissolve 12 Gm. of potassium hydroxide in 8 cc. of water. The solutions should be freshly prepared and mixed immediately before using.

Resorcinol Test Solution—Dissolve 1 Gm. of resorcinol in sufficient reagent hydrochloric acid to make 100 cc.

Schweitzer's Reagent—Use *Cupric Oxide Ammoniated T.S.*, page 836.

Silver-Ammonium Nitrate Test Solution—Dissolve 1 Gm. of silver nitrate in 20 cc. of water. Add ammonia T.S., drop by drop, with constant stirring, until the precipitate is almost but not entirely dissolved. Filter and preserve the solution in dark amber-colored, well-stoppered bottles.

Silver Nitrate Test Solution—Use *Tenth-normal Silver Nitrate*, page 862.

Silver Sulfate Test Solution—Add 1 Gm. of silver sulfate to 100 cc. of water in a glass-stoppered bottle, shake thoroughly and allow to stand over night. Decant the clear solution when required for use.

Sodium Acetate Test Solution (1 N.)—Dissolve 13.6 Gm. of sodium acetate in sufficient water to make 100 cc.

Sodium Bisulfite Test Solution—Dissolve 10 Gm. of sodium bisulfite in sufficient water to make 30 cc. The solution must be freshly prepared.

Sodium Bitartrate Test Solution (1 N.)—Dissolve 1 Gm. of sodium bitartrate in sufficient water to make 10 cc. This test solution must be freshly prepared.

Sodium Carbonate Test Solution (2 N.)—Dissolve 12.5 Gm. of monohydrated sodium carbonate in sufficient water to make 100 cc.

Sodium Cobaltinitrite Test Solution—Dissolve 10 Gm. of sodium cobaltinitrite in sufficient water to make 50 cc. and filter, if necessary.

Sodium Fluoride Test Solution—Dry about 500 mg. of reagent sodium fluoride at 200° for 4 hours. Weigh accurately 222 mg. of the dried sodium fluoride and dissolve it in sufficient water to make exactly 100 cc. Dilute exactly 10 cc. of the solution with water to make 1000 cc. Each cc. of this solution corresponds to 0.01 mg. of fluorine.

Sodium Hydrosulfite Test Solution, Alkaline—Dissolve 25 Gm. of potassium hydroxide in 35 cc. of water, and 50 Gm. of sodium hydrosulfite in 250 cc. of water. When the test solution is required, mix 40 cc. of the hydroxide solution with the 250 cc. of the hydrosulfite solution. The sodium hydrosulfite solution should be freshly prepared.

Sodium Hydroxide Test Solution (1 N.)—Dissolve 4.3 Gm. of sodium hydroxide in sufficient water to make 100 cc.

Sodium Hypobromite Test Solution—To a solution of 20 Gm. of sodium hydroxide in 75 cc. of water, add 5 cc. of bromine. After solution has taken place, add sufficient water to make 100 cc. It must be freshly prepared.

Sodium Hypochlorite Test Solution—Triturate 100 Gm. of chlorinated lime with 500 cc. of water, gradually added until a uniform mixture results. Dissolve 70 Gm. of monohydrated sodium carbonate in 500 cc. of warm water, and add this solution, with constant stirring, to the suspension of chlorinated lime. Transfer the mixture to a wetted muslin filter and return the first portion of filtrate until the filtrate becomes clear. Add a few drops of sodium carbonate T.S. to 10 cc. of the clear filtrate: if the liquid becomes turbid, return the filtrate and precipitate to the precipitation vessel, add sufficient monohydrated sodium carbonate to precipitate the excess of lime, and refilter. Finally wash the drained precipitate with sufficient water to make the filtrate and washings weigh 1000 Gm.

Sodium Nitroprusside Test Solution—Dissolve 1 Gm. of sodium nitroprusside in sufficient water to make 20 cc. It must be freshly prepared.

Sodium Phosphate Test Solution (1 N.)—Dissolve 12 Gm. of clear crystals of sodium phosphate in sufficient water to make 100 cc.

Sodium Phosphotungstate Test Solution—To a solution of 20 Gm. of sodium tungstate in 100 cc. of water, add sufficient phosphoric acid to impart a strongly acid reaction to litmus paper, and filter. When required for use, decant the clear solution from any sediment that may be present. Preserve the solution in amber-colored, glass-stoppered bottles.

Sodium Sulfide Test Solution (1 N.)—Dissolve 1 Gm. of sodium sulfide in sufficient water to make 10 cc. This test solution must be freshly prepared.

Sodium Tartrate Test Solution (1 N.)—Dissolve 11.5 Gm. of sodium tartrate in sufficient water to make 100 cc.

Sodium Thiosulfate Test Solution—Use *Tenth-normal Sodium Thiosulfate*, page 866.

Standard Lead Solution—See page 657.

Stannous Chloride Test Solution—Dissolve 1.5 Gm. of stannous chloride in 10 cc. of water containing a small amount of hydrochloric acid. Preserve the solution in a glass-stoppered bottle in which a fragment of reagent tin has been placed. The solution must be freshly prepared at frequent intervals.

Stannous Chloride Test Solution, Acid—Dissolve 8 Gm. of stannous chloride in 500 cc. of reagent hydrochloric acid. This solution should be used within 3 months after the time of its preparation. Preserve in a glass-stoppered bottle.

Sulfanilic Acid Test Solution—Dissolve 800 mg. of sulfanilic acid in 100 cc. of acetic acid. Preserve in well-stoppered bottles

Sulfanilic-α-Naphthylamine Test Solution—Dissolve 500 mg. of sulfanilic acid in 150 cc. of acetic acid. Dissolve 100 mg. of α-naphthylamine hydrochloride in 150 cc. of acetic acid and mix the two solutions. The pink color which may develop on standing can be removed by treatment with zinc dust.

Sulfuric Acid-Formaldehyde Test Solution—Add 1 drop of formaldehyde T.S. to each cc. of sulfuric acid and mix. This test solution should be freshly prepared.

Sulfurous Acid Test Solution—Use *Sulfurous Acid*, page 828.

Tannic Acid Test Solution—Dissolve 1 Gm. of tannic acid in 1 cc. of alcohol and add sufficient water to measure 10 cc. This solution should be freshly prepared.

Tartaric Acid Test Solution (4 N.)—Dissolve 3 Gm. of tartaric acid in sufficient water to measure 10 cc. This solution should be freshly prepared.

Triketohydrindene Hydrate Test Solution—Dissolve 200 mg. of triketohydrindene hydrate in sufficient water to make 10 cc. This solution should be freshly prepared.

Trinitrophenol Test Solution (*Picric Acid Test Solution*)—Dissolve the equivalent of 1 Gm. of anhydrous trinitrophenol in 100 cc. of hot water. Cool the solution and filter, if necessary.

Turmeric Test Solution—Macerate 20 Gm. of powdered turmeric, the dried root of *Curcuma longa* Linné (Fam. *Zingiberaceæ*), with four successive portions of 100 cc. each of cold water, decanting the clear liquid portion each time and discarding it. Dry the residue at a temperature not over 100°. Macerate with 100 cc. of alcohol for several days and filter.

Colorimetric Solutions (C. S.)

These solutions are used in the preparation of the colorimetric standards for certain drugs, and the carbonization tests with sulfuric acid which are applied to a number of organic compounds in the Pharmacopœia. These solutions must be

accurately standardized as described under the various titles, and must be stored in glass-stoppered bottles made of insoluble glass.

When colors of pharmacopœial substances or pharmacopœial test mixtures are to be compared with color standards, the several containers shall be of clear, colorless glass and must be alike in cross section. The comparison of colors must be made in layers of equal thickness, and viewed transversely against a white background.

Preparation of the Permanent Color Standards

Cobaltous Chloride Colorimetric Solution—Dissolve about 65 Gm. of cobaltous chloride, $CoCl_2.6H_2O$, in enough of a mixture of 25 cc. of hydrochloric acid and 975 cc. of water to make 1000 cc. Place exactly 5 cc. of this solution in a 250-cc., glass-stoppered flask, add 5 cc. of hydrogen peroxide solution and 15 cc. of sodium hydroxide (1 to 5), boil for 10 minutes, cool, and add 2 Gm. of potassium iodide and 20 cc. of sulfuric acid (1 to 4). When the precipitate has dissolved, titrate the liberated iodine with tenth-normal sodium thiosulfate. Each cc. of tenth-normal sodium thiosulfate is equivalent to 23.80 mg. of $CoCl_2.6H_2O$. Adjust the final volume of the solution by the addition of enough of the mixture of hydrochloric acid and water to make each cc. contain 59.50 mg. of $CoCl_2.6H_2O$.

Cupric Sulfate Colorimetric Solution—Dissolve about 65 Gm. of reagent cupric sulfate in enough of a mixture of 25 cc. of hydrochloric acid and 975 cc. of water to make 1000 cc. of solution. Assay exactly 10 cc. of this solution as directed under *Cupric Sulfate*, page 157, and adjust the final volume of the solution by the addition of enough of the mixture of hydrochloric acid and water to make each cc. contain 62.43 mg. of $CuSO_4.5H_2O$.

Ferric Chloride Colorimetric Solution—Dissolve about 55 Gm. of reagent ferric chloride in enough of a mixture of 25 cc. of hydrochloric acid and 975 cc. of water to make 1000 cc. Measure exactly 10 cc. of the solution into a glass-stoppered flask, add 15 cc. of water, and proceed as directed in the *Assay* of *Ferric Ammonium Citrate*, page 220, beginning with "add 5 cc. of hydrochloric acid." Each cc. of tenth-normal sodium thiosulfate is equivalent to 27.03 mg. of $FeCl_3.6H_2O$. Adjust the final volume of the solution by the addition of enough of the mixture of hydrochloric acid and water to make each cc. contain 45.05 mg. of $FeCl_3.6H_2O$.

Indicators

In the Pharmacopœia indicators are used either to indicate the completion of a chemical reaction in volumetric analyses or to indicate the hydrogen ion concentration, pH, of solutions.

Solutions of indicators which are used for volumetric determinations are referred to as Test Solutions, abbreviated T.S., and those used for the determination of hydrogen ion concentration are termed pH Indicators.

Most of the indicators for acid-base titrations and for pH measurement are acidic. They contain a carboxyl, a sulfonic, or a phenolic group. In many instances the same indicator is applicable either to acid-base titrations or to pH measurements, the difference being only in the preparation of the indicator solution. The following are the acid-base and pH indicators of the Pharmacopœia:

Bromocresol Green (*Bromocresol Blue; Tetrabromo-m-cresolsulfonphthalein*)—White or pale buff-colored powder. Slightly soluble in water, soluble in alcohol or in solutions of alkali hydroxides. Transition interval: from 3.8 to 5.4 pH. Color change: from yellow to blue.

Bromocresol Purple (*Dibromo-o-cresolsulfonphthalein*)—White to pink, crystalline powder. Insoluble in water, soluble in alcohol and in solutions of alkali hydroxides. Transition interval: from 5.2 to 6.8 pH. Color change: from yellow to purple.

Bromophenol Blue (*Tetrabromophenolsulfonphthalein*)—Pinkish crystals. Soluble in alcohol, insoluble in water, soluble in solutions of alkali hydroxides. Transition interval: from 3.0 to 4.6 pH. Color change: from yellow to blue.

Bromothymol Blue (*Dibromothymolsulfonphthalein*)—Rose-red powder. Soluble in alcohol, insoluble in water, soluble in solutions of alkali hydroxides. Transition interval: from 6.0 to 7.6 pH. Color change: from yellow to blue.

Litmus—Blue powder, cubes, or pieces. Partly soluble in water and in alcohol. Transition interval: approximately 4.5 to 8 pH. Color change: from red to blue. Litmus is unsuitable for determining alkaloids, carbonates, and bicarbonates.

Methyl Orange (*Helianthin* or *Tropæolin D*)—The sodium salt of dimethylaminoazobenzene sulfonic acid or dimethylaminoazobenzene sodium sulfonate. Orange-yellow powder or crystalline scales. Slightly soluble in cold water, insoluble in alcohol; readily soluble in hot water. Transition interval: from 3.1 to 4.4 pH. Color change: from pink to yellow.

Methyl Red (*Dimethylaminoazobenzene-o-carboxylic acid; o-carboxy benzene-azo-dimethylaniline*)—Dark red powder or violet crystals. Sparingly soluble in water, soluble in alcohol. Transition interval: from 4.2 to 6.3 pH. Color change: from red to yellow.

Methyl Yellow (*Dimethylaminoazobenzene*)—Yellow crystals, melting between 114° and 117°. Insoluble in water, soluble in alcohol, benzene, chloroform, ether, dilute mineral acids, and oils. Transition interval: from 2.9 to 4.0 pH. Color change: from red to yellow.

Phenol Red—Use *Phenolsulfonphthalein*, page 407. Transition interval: from 6.8 to 8.4 pH. Color change: from yellow to red.

Phenolphthalein—Use *Phenolphthalein*, page 406. Transition interval: from 8.3 to 10 pH. Color change: from colorless to red.

Thymol Blue (*Thymolsulfonphthalein*)—Dark-colored, crystalline powder. Slightly soluble in water, soluble in alcohol and in diluted alkali solutions. *Acid*—Transition interval: from 1.2 to 2.8 pH. Color change: from red to yellow. *Alkaline*—Transition interval: from 8 to 9.6 pH. Color change: from yellow to blue.

Thymolphthalein—White to slightly yellow, crystalline powder. Insoluble in water, soluble in alcohol and in solutions of alkali hydroxides. Transition interval: from 9.3 to 10.5 pH. Color change: from colorless to blue.

Indicator Solutions for Volumetric Determinations

These indicator solutions include acid-base indicator solutions, as well as other solutions used in volumetric analyses.

Unless otherwise stated, each acid-base indicator solution is so adjusted that when 0.15 cc. of the indicator solution is added to 25 cc. of carbon dioxide-free water, 0.25 cc. of fiftieth-normal acid or alkali, respectively, will produce the characteristic color changes.

Acid-base Indicator Test Solutions

Bromocresol Green Test Solution—Dissolve 50 mg. of bromocresol green in 100 cc. of alcohol, and filter, if necessary.

Bromocresol Purple Test Solution—Dissolve 50 mg. of bromocresol purple in 100 cc. of alcohol, and filter, if necessary.

Bromophenol Blue Test Solution—Dissolve 100 mg. of bromophenol blue in 100 cc. of diluted alcohol, and filter, if necessary.

Bromothymol Blue Test Solution—Dissolve 100 mg. of bromothymol blue in 100 cc. of diluted alcohol, and filter, if necessary.

Litmus Test Solution—Digest 25 Gm. of powdered litmus with three successive portions of 100 cc. each of boiling alcohol, continuing each extraction for about 1 hour. Filter, wash with alcohol, and discard the alcohol filtrate. Macerate the residue with about 25 cc. of cold water for 4 hours, filter, and discard the filtrate. Finally digest the residue with 125 cc. of boiling water for 1 hour, cool, and filter. Preserve the filtrate in wide-mouthed bottles, stoppered with loose plugs of purified cotton.

Methyl Orange Test Solution—Dissolve 100 mg. of methyl orange in 100 cc. of water, and filter, if necessary.

Methyl Red Test Solution—Dissolve 100 mg. of methyl red in 100 cc. of alcohol, and filter, if necessary.

Phenol Red Test Solution—Dissolve 100 mg. of phenol red in 100 cc. of alcohol, and filter, if necessary.

Phenolphthalein Test Solution—Dissolve 1 Gm. of phenolphthalein in 100 cc. of alcohol.

Thymol Blue Test Solution—Dissolve 100 mg. of thymol blue in 100 cc. of alcohol, and filter, if necessary.

Thymolphthalein Test Solution—Dissolve 100 mg. of thymolphthalein in 100 cc. of alcohol, and filter, if necessary.

Other Indicator Test Solutions

Diiodofluorescein Test Solution—Dissolve 500 mg. of diiodofluorescein in a mixture of 75 cc. of alcohol and 30 cc. of water.

Ferric Ammonium Sulfate Test Solution—Dissolve 8 Gm. of ferric ammonium sulfate in sufficient water to make 100 cc.

Ortho-phenanthroline Test Solution—Dissolve 150 mg. of ortho-phenanthroline in 10 cc. of a solution of ferrous sulfate, prepared by dissolving 1.48 Gm. of clear crystals of ferrous sulfate in 100 cc. of water. The ferrous sulfate solution must be prepared immediately before dissolving the ortho-phenanthroline. Preserve the solution in well-closed containers.

Potassium Chromate Test Solution—Dissolve 10 Gm. of potassium chromate in sufficient water to make 100 cc.

Sodium Alizarinsulfonate Test Solution—Dissolve 100 mg. of sodium alizarinsulfonate in 100 cc. of water, and filter, if necessary.

Starch Iodide Paste Test Solution—Heat 100 cc. of water in a 250-cc. beaker to boiling, add a solution of 0.75 Gm. of potassium iodide in 5 cc. of water, then follow with 2 Gm. of zinc chloride dissolved in 10 cc. of water, and, while the solution is boiling, add, with stirring, a smooth suspension of 5 Gm. of potato starch in 30 cc. of cold water. Continue to boil for 2 minutes, and then cool. Preserve in well-closed containers in a cold place.

Starch iodide paste test solution must show a definite blue streak when a glass rod, dipped in a mixture of 1 cc. of tenth-molar sodium nitrite, 500 cc. of water, and 10 cc. of hydrochloric acid, is streaked on a smear of the paste.

Starch-Potassium Iodide Test Solution—Dissolve 500 mg. of potassium iodide in 100 cc. of freshly prepared starch T.S. This solution is not to be used if it is more than 24 hours old.

Starch Test Solution—Triturate 1 Gm. of arrowroot starch with 10 cc. of cold water, and pour slowly, with constant stirring, into 200 cc. of boiling water. Boil the mixture until a thin, translucent fluid is obtained. (Longer boiling than necessary renders the solution less sensitive.) Allow to settle and use only the clear supernatant liquid. This test solution must be freshly prepared.

Indicator Papers

Strong, white filter paper is treated with hydrochloric acid and washed with water until the washings no longer show an acid reaction to methyl red. It is then treated with ammonia T.S. and again washed with water until the washings are no longer alkaline toward phenolphthalein. It is then thoroughly dried.

The dry paper is then saturated with the proper strength indicator solution and carefully dried. The drying is accomplished by suspending the paper in a room free from acid or alkali fumes.

The papers so prepared are kept in glass-stoppered bottles, carefully protected from light and moisture.

Litmus Paper, Blue—Usually in the form of strips about 50 mm. in length and 6 mm. in width.

Phosphate—Place 10 strips in 10 cc. of water to which have been added 1 cc. of nitric acid and 0.5 cc. of ammonia T.S. Allow to stand for 10 minutes. Decant

the solution, warm, and add 5 cc. of ammonium molybdate T.S. Shake at about 40° for 5 minutes. No precipitate of phosphomolybdate should be produced.

Residue on ignition—Ignite carefully 10 strips of the paper to constant weight: the weight of the residue corresponds to not more than 0.4 mg. per strip of about 3 sq. cm.

Rosin acids, etc.—Immerse a strip of the blue paper in a solution of 100 mg. of silver nitrate in 50 cc. of water: the color of the paper does not change in 30 seconds.

Sensitiveness—Drop a 10- to 12-mm. strip into 100 cc. of 0.0005-normal acid contained in a beaker, and stir continuously: the color of the paper is changed within 45 seconds. The 0.0005-normal acid is prepared by diluting 1 cc. of tenth-normal hydrochloric acid with freshly boiled and cooled distilled water to 200 cc.

Litmus Paper, Red—Usually in the form of strips about 50 mm. in length and 6 mm. in width.

Red Litmus Paper meets the requirements for *phosphate, residue on ignition,* and *rosin acids, etc.,* under *Litmus Paper, Blue.*

Sensitiveness—Drop a 10- to 12-mm. strip into 100 cc. of 0.0005-normal sodium hydroxide contained in a beaker, and stir continuously: the color of the paper changes within 30 seconds. The 0.0005-normal sodium hydroxide is prepared by diluting 1 cc. of tenth-normal sodium hydroxide with freshly boiled and cooled water to 200 cc.

Phenolphthalein Paper—Prepared from a 0.1 per cent solution of phenolphthalein in diluted alcohol.

Starch Iodide Paper—Impregnate strips of white filter paper with a solution of 500 mg. of potassium iodide in 100 cc. of freshly prepared starch T.S.

Turmeric Paper—Impregnate strips of white filter paper with turmeric T.S.

Sensitiveness—Dip a strip of the paper, of about 1.5 cm. length, in a solution of 1.0 mg. of boric acid in 5 cc. of water, previously mixed with 1 cc. of hydrochloric acid. After 1 minute remove the paper from the liquid and allow it to dry: the yellow color changes to brown. Now moisten the paper with ammonia T.S.: the color of the paper changes to greenish black.

pH Indicators and Preparation of Their Solutions

The indicators used for colorimetric pH determinations are either weakly acid or weakly basic. However, most of the indicators used for this purpose, such as the phthaleins and sulfonated phthaleins, behave like weak acids.

The usual concentration of the indicator solution is 0.05 per cent. From 0.1 to 0.2 cc. of the indicator solution is generally used for 10 cc. of the liquid being examined.

Solutions of indicators of the basic type and of the phthaleins are prepared by dissolving them in alcohol. In preparing solutions of indicators containing an acid group, this group must first be neutralized with sodium hydroxide. The procedure is as follows:

Triturate 100 mg. of the indicator in an agate mortar with the volume of twentieth-normal sodium hydroxide specified in the following table, or with its

equivalent of fiftieth-normal sodium hydroxide. When the indicator has dissolved, the solution is diluted with carbon-dioxide-free water to make 200 cc. (0.05 per cent).

The solutions should be kept in stoppered bottles, and protected from light.

Table of pH Indicators

	pH Range	Molecular Weight	Color Change	Solvent or Solubilizer
Methyl Yellow	2.9– 4.0	225	Red-yellow	Alcohol
Bromophenol Blue	3.0– 4.6	669	Yellow-blue	3.0 cc. N/20 NaOH
Bromocresol Green	3.8– 5.4	699	Yellow-blue	7.2 cc. N/20 NaOH
Methyl Red	4.2– 6.3	269	Red-yellow	7.4 cc. N/20 NaOH
Bromocresol Purple	5.2– 6.8	540	Yellow-purple	3.7 cc. N/20 NaOH
Bromothymol Blue	6.0– 7.6	624	Yellow-blue	3.2 cc. N/20 NaOH
Phenol Red	6.8– 8.4	354	Yellow-red	5.7 cc. N/20 NaOH
Thymol Blue	8.0– 9.6	466	Yellow-blue	4.3 cc. N/20 NaOH
Thymolphthalein	9.3–10.5	430	Colorless-blue	Alcohol

Volumetric Apparatus

It is essential that all measuring vessels, burettes, flasks, pipettes, etc., shall be accurately calibrated at the standard temperature of 25° or at such other temperature as seems best for the particular locality in which the apparatus is to be used. All volumetric solutions, if practicable, shall be prepared, standardized, and used at this standard temperature. If a titration is carried out at a markedly different temperature, the volumetric solution should be standardized at that same temperature or a suitable temperature correction made. Apparatus calibrated at other temperatures (15°–25°) may be used, provided the volumetric solutions are standardized and used at this same temperature or necessary temperature corrections made.

Measuring Flasks—Standard measuring flasks are calibrated to contain, when filled to the mark, 1000, 500, 250, 200, 100, or 50 cc. at 25°. The necks must measure not less than 14 mm. and not more than 20 mm. in diameter for 1000-cc. capacity; from 12 mm. to 18 mm. for 500-cc. capacity; from 10 mm. to 15 mm. for 250-cc. capacity; from 8 mm. to 12 mm. for 100-cc. capacity, and from 6 mm. to 10 mm. for 50-cc. capacity. The capacity mark on any of these flasks should be not less than 6 cm. distant from the mouth and not less than 2 cm. from the base of the neck. The limits of error permitted in the calibration of flasks shall be those accepted by the United States Bureau of Standards, which are as follows:

Contents of flask	50 cc.	100 cc.	250 cc.	500 cc.	1000 cc.
Limit of error in cc.	0.05	0.08	0.12	0.15	0.30
Limit of error in per cent	0.10	0.08	0.05	0.03	0.03

Cylinders—Cylinders should be graduated to contain their respective volumes at the standard temperature. The inside diameter must not be more than one-fifth of the graduated length.

Transfer Pipettes—Pipettes should be graduated to deliver at standard temperature the volume indicated. The suction stem should be at least 16 cm. long, and the delivery tube not less than 3 cm. and not more than 25 cm. long. The in-

side diameter at the capacity mark must not be less than 2 mm. It must not exceed 4 mm. for pipettes up to and including 25-cc. capacity, 5 mm. for 50-cc. capacity, and 6 mm. for 100-cc. and 200-cc. capacities. The capacity mark must not be more than 6 cm. from the bulb. The outlet of any transfer pipette must be of such size that the free outflow for water shall last not more than 1 minute. Not less than 15 seconds shall be required to empty a 5-cc. pipette, 20 seconds for a 10-cc. pipette, 30 seconds for a 50-cc. pipette, 40 seconds for a 100-cc. pipette, and a minimum of 50 seconds for a 200-cc. pipette. After filling, the liquid adhering to the outside should be wiped from the stem. When emptying the contents, the pipette should be held in a vertical position and the outflow should be unrestricted until the surface of the liquid reaches the upper end of the delivery tube; the tip should then be touched to the wet surface of the receiving vessel and kept in contact with it until the emptying is complete. Pipettes should never be drained by blowing into them unless, as in the case of the Ostwald pipettes, they are especially graduated for use in this way.

The limits of error permitted in the calibration of pipettes shall be those accepted by the United States Bureau of Standards, which are as follows:

Contents of pipettes	2 cc.	5 cc.	10 cc.	25 cc.	50 cc.	100 cc.
Limit of error in cc.	0.006	0.01	0.02	0.03	0.05	0.08
Limit of error in per cent	0.30	0.20	0.20	0.12	0.10	0.08

It is essential that in using pipettes the same procedure be employed as was used in the calibration.

Burettes—All burettes should be provided with glass stopcocks and calibrated for use at the standard or other temperature at which they are to be used. Burettes provided with rubber tubes, pinch-cocks, and glass delivery tubes in place of glass stopcocks may be used for potassium and sodium hydroxide solutions and such other solutions as are best used in this type of burette. The glass tips should be from 2 to 3 cm. in length, gradually tapered and straight or slightly bent. The rate of outflow should be regulated so that not less than 2 seconds should be consumed for each cc. delivered. When completing a titration, the tip of the delivery tube should be touched to the wet inner surface of the receiving vessel and the solution again stirred.

General Directions—All bottles in which volumetric solutions are to be kept, as well as the burettes or pipettes in which they are to be measured, should be thoroughly cleansed prior to use, then rinsed with water, and afterward with 2 or 3 small portions of the solution that they are to contain. Readings should always be made from the lowest point of a meniscus unless the liquid is too opaque to permit exact observation of that point. It is of the utmost importance that the inner surface of all measuring apparatus shall be free from dirt or grease.

Volumetric Solutions

Normal Solutions—Normal solutions are solutions which contain 1 gram equivalent weight of the active substance in each 1000 cc. of solution; that is, an amount equivalent to 1.0080 Gm. of hydrogen or 8.000 Gm. of oxygen. Normal solutions and solutions bearing a specific relationship to "normal solutions," and used in volumetric determinations are designated as follows: Normal, N/1 or 1 N;

double-normal, 2 N; half-normal, N/2 or 0.5 N; tenth-normal, N/10 or 0.1 N; fiftieth-normal, N/50 or 0.02 N; hundredth-normal, N/100 or 0.01 N; two-hundredth-normal, N/200 or 0.005 N; thousandth-normal, N/1000 or 0.001 N.

Molar Solutions are solutions which contain in 1000 cc. 1 gram-molecule of the reagent. Thus: a molar solution of sulfuric acid would contain 98.08 Gm. of H_2SO_4 in a liter of the solution, and a molar solution of potassium dichromate would contain 294.21 Gm. of $K_2Cr_2O_7$ in a liter of the solution. Solutions containing in 1000 cc. one-tenth of a gram-molecule of the reagent are designated "tenth-molar" M/10, and other molarities are similarly indicated.

Empirical Solutions—It is frequently difficult to maintain the theoretical standard of many solutions. For this reason it is not essential that such standard normalities be maintained, or even attained originally. A solution of approximately the desired normality is prepared and the correction factor accurately determined. This correction factor is used in all calculations where such empirical solutions are employed. As the value of a standard solution may change upon standing, the concentration should frequently be redetermined.

All volumetric solutions, whether made by direct solution or by dilution of a stronger solution, must be thoroughly mixed by vigorous shaking before standardization.

When solutions of a particular substance are used in several normalities, the details of the preparation and standardization are usually given for the normality most frequently required. Stronger or weaker solutions are prepared and standardized in the same general manner as described, using proportionate amounts of material. It is possible in many instances to prepare accurately lower normalities by making an exact dilution of the stronger solutions. Alkali hydroxide solutions, when prepared by dilution, should be standardized by the method of titration described under the stronger solution.

Low normalities, such as one-hundredth or lower, of solutions which are not stable as, for instance, one-hundredth-normal potassium permanganate, one-hundredth or lower normality sodium thiosulfate, are preferably prepared by exactly diluting the higher normality with thoroughly boiled and cooled water on the same day they are required for use.

Preparation, Methods of Standardization, and Equivalents of Volumetric Solutions

Under volumetric solutions 1 or 2 methods are usually given for standardization, but other methods of standardization, capable of yielding at least the same degree of accuracy, may be used.

Acetic Acid, Double-Normal

$HC_2H_3O_2 = 60.05$ 120.10 Gm. in 1000 cc.

Add 116 cc. of glacial acetic acid to sufficient water to make 1000 cc. after cooling to room temperature.

Ammonium Thiocyanate, Tenth-Normal

NH_4SCN = 76.12 7.612 Gm. in 1000 cc.

Dissolve about 8 Gm. of reagent ammonium thiocyanate in 1000 cc. of water, and determine the exact normality by titrating the solution against tenth-normal silver nitrate as follows:

Measure accurately from a burette about 30 cc. of the tenth-normal silver nitrate into a glass-stoppered flask. Dilute with 50 cc. of water, then add 2 cc. of nitric acid and 2 cc. of ferric ammonium sulfate T.S. and titrate with the ammonium thiocyanate solution to the first appearance of a red brown color. Calculate the normality, and, if desired, adjust the solution exactly to tenth-normal.

If desirable, tenth-normal ammonium thiocyanate may be replaced by tenth-normal sodium or potassium thiocyanate where the former is directed in various tests and assays.

One cubic centimeter of Tenth-Normal Ammonium Thiocyanate is the equivalent of:

	Milligrams
Ammonium Thiocyanate, NH_4SCN	7.612
Mercuric Oxide, HgO	10.83
Mercury, Hg	10.03
Silver, Ag	10.79
Silver Nitrate, $AgNO_3$	16.99

Bromine, Tenth-Normal

Koppeschaar's Solution

Br = 79.92 7.992 Gm. in 1000 cc.

Dissolve 3 Gm. of potassium bromate and 15 Gm. of potassium bromide in sufficient water to make 1000 cc. and determine its exact normality as follows:

Measure accurately from a burette about 25 cc. of the solution into a 500-cc. iodine flask and dilute with 120 cc. of water. Add 5 cc. of hydrochloric acid, stopper the flask, and shake it gently. Then add 5 cc. of potassium iodide T.S., re-stopper, shake the mixture, allow it to stand for 5 minutes, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator. Calculate the normality and, if desired, adjust exactly to tenth-normal.

Preserve it in dark amber-colored, glass-stoppered bottles.

One cubic centimeter of Tenth-Normal Bromine is the equivalent of:

	Milligrams
Bromine, Br	7.992
Hexylresorcinol, $C_{12}H_{18}O_2$	4.857
Phenol, C_6H_5OH	1.569
Phenolsulfonphthalein, $C_{19}H_{14}O_5S$	4.430
Resorcinol, $C_6H_4(OH)_2$	1.835

Ceric Sulfate, Tenth-Normal

$Ce(SO_4)_2$ = 332.25 — 33.23 Gm. in 1000 cc.

Dissolve 42 Gm. of reagent ceric sulfate in about 500 cc. of water containing 28 cc. of sulfuric acid, warming if necessary. When solution is complete, cool, add sufficient water to make 1000 cc., and mix well. Standardize the solution as follows:

Weigh accurately from 170 to 200 mg. of clean, dry reagent iron wire and transfer to a 250-cc. or a 300-cc. flask. Add 50 cc. of diluted sulfuric acid and close the flask with a valve-stopper prepared as described in the assay for *Potassium Chlorate*, page 799. Heat on a steam bath until the iron is dissolved. Cool the solution, dilute it with 50 cc. of freshly boiled and cooled water, add 2 drops of orthophenanthroline T.S., and titrate with the ceric sulfate solution from a burette until the red color is changed to pale blue. Calculate the normality and, if desired, adjust the solution exactly to tenth-normal.

One cubic centimeter of Tenth-Normal Ceric Sulfate is the equivalent of:

	Milligrams
Ceric Sulfate, anhydrous, $Ce(SO_4)_2$	33.23
Iron, Fe	5.585
Ferrous Carbonate, $FeCO_3$	11.59
Ferrous Sulfate, $FeSO_4.7H_2O$	27.80
Menadione, $C_{11}H_8O_2$	8.609

Ceric Sulfate, Fiftieth-Normal

Dilute exactly 200 cc. of the tenth-normal solution with sufficient of a mixture of equal volumes of diluted sulfuric acid and water to make exactly 1000 cc.

One cubic centimeter of Fiftieth-Normal Ceric Sulfate is the equivalent of:

	Milligrams
Ceric Sulfate, anhydrous, $Ce(SO_4)_2$	6.646
Menadione, $C_{11}H_8O_2$	1.722
Potassium Chloride (by Cobaltinitrite Method)	0.249

Ferrous Ammonium Sulfate, Fiftieth-Normal

$Fe(NH_4)_2(SO_4)_2.6H_2O$ = 392.14 — 7.843 Gm. in 1000 cc.

Dissolve 8.0 Gm. of reagent ferrous ammonium sulfate in 100 cc. of a previously cooled mixture of 20 cc. of sulfuric acid and 100 cc. of water, dilute with water to 1000 cc., and mix well. Then standardize as follows:

Place an accurately measured volume of 25 to 30 cc. of the solution in a flask, add 2 drops of orthophenanthroline T.S., and titrate with fiftieth-normal ceric sulfate until the red color is changed to pale blue. From the volume of fiftieth-normal ceric sulfate consumed, calculate the normality of the ferrous ammonium sulfate solution.

Hydrochloric Acid, Normal

$HCl = 36.47$ 36.47 Gm. in 1000 cc.

Dilute 95 cc. of hydrochloric acid with water to make 1000 cc.

This solution may be standardized by one of the following methods:

Method I. Accurately weigh about 1.5 Gm. of reagent anhydrous sodium carbonate which has been heated at a temperature of about 270° for 1 hour. Dissolve it in 100 cc. of water and add 2 drops of methyl orange T.S. Add the acid slowly from a burette, with constant stirring, until the color is changed from yellow to pale pink. Calculate the normality and, if desired, adjust exactly to normal.

Method II. Measure accurately from a burette 20 cc. of the acid into a 300-cc. beaker. Dilute with 130 cc. of water and add 5 drops of nitric acid. Now add slowly, with constant stirring, 40 cc. of a 10 per cent solution of silver nitrate, or more if necessary, until precipitation is complete. Boil the mixture cautiously for 5 minutes, and allow the solution to stand in the dark until the precipitate has settled to the bottom of the beaker and the supernatant liquid has become clear. Transfer the precipitate completely to a tared filtering crucible and wash it with water, slightly acidified with nitric acid, until the washings give no test for silver. Dry to constant weight at about 110°. From the weight of silver chloride obtained, calculate the normality of the hydrochloric acid and, if desired, adjust it exactly to normal. The silver chloride should be protected from light as much as possible during the determination.

One cubic centimeter of Normal Hydrochloric Acid is the equivalent of:

	Milligrams
Hydrogen Chloride, HCl	36.47
Barium Carbonate, $BaCO_3$	98.69
Barium Hydroxide, $Ba(OH)_2.8H_2O$	157.8
Calcium Carbonate, $CaCO_3$	50.05
Calcium Hydroxide, $Ca(OH)_2$	37.05
Calcium Oxide, CaO	28.04
Potassium Hydroxide, KOH	56.10
Sodium Borate, anhydrous, $Na_2B_4O_7$	100.6
Sodium Borate, hydrated, $Na_2B_4O_7.10H_2O$	190.7
Sodium Cacodylate, anhydrous, $Na(CH_3)_2.AsO_2$	160.0
Sodium Carbonate, anhydrous, Na_2CO_3	53.00
Sodium Hydroxide, $NaOH$	40.01

Hydrochloric Acid, Half-Normal

One cubic centimeter of Half-Normal Hydrochloric Acid is the equivalent of:

	Milligrams
Hydrogen Chloride, HCl	18.23

Other factors are identical with those given under Half-normal Sulfuric Acid.

Hydrochloric Acid, Tenth-Normal

One cubic centimeter of Tenth-Normal Hydrochloric Acid is the equivalent of:

	Milligrams
Hydrogen Chloride, HCl	3.647
Ethylenediamine, $C_2H_4(NH_2)_2$	3.005
Sodium Benzoate, $NaC_7H_5O_2$	14.41
Sodium Lactate, $CH_3CHOH.COONa$	11.21

Other factors are identical with those given under Tenth-Normal Sulfuric Acid.

Hydrochloric Acid, Fiftieth-Normal

One cubic centimeter of Fiftieth-Normal Hydrochloric Acid is the equivalent of:

	Milligrams
Hydrogen Chloride, HCl	0.7294

Other factors are identical with those given under Fiftieth-Normal Sulfuric Acid.

Hydrochloric Acid, Hundredth-Normal

One cubic centimeter of Hundredth-Normal Hydrochloric Acid is the equivalent of:

	Milligrams
Hydrogen Chloride, HCl	0.3647

Hydrochloric Acid, Thousandth-Normal

One cubic centimeter of Thousandth-Normal Hydrochloric Acid is the equivalent of:

	Milligrams
Hydrogen Chloride, HCl	0.03647

Iodine, Tenth-Normal

I = 126.92 — 12.692 Gm. in 1000 cc.

Method I. Weigh accurately about 12.75 Gm. of reagent iodine and transfer it quickly into a solution of 36 Gm. of potassium iodide in 100 cc. of water. After solution is complete, add 3 drops of hydrochloric acid and dilute to exactly 1000 cc. at 25°. From the weight of the iodine used calculate the normality. The normality of the solution should frequently be redetermined.

Method II. Dissolve about 14 Gm. of reagent iodine in a solution of 36 Gm. of potassium iodide in 100 cc. of water, add 3 drops of hydrochloric acid, dilute to 1000 cc., and standardize as follows:

Weigh accurately about 150 mg. of reagent arsenic trioxide and dissolve it in 20 cc. of normal sodium hydroxide by warming if necessary. Dilute with 40 cc. of water, add 2 drops of methyl orange T.S. and follow with diluted hydrochloric acid until the yellow color is changed to pink. Then add 2 Gm. of sodium bicarbonate, dilute with 50 cc. of water, and add 3 cc. of starch T.S. Slowly add

the iodine solution from a burette until a permanent blue color is produced. Calculate the normality and, if desired, adjust exactly to tenth-normal.

Preserve in glass-stoppered bottles.

One cubic centimeter of Tenth-Normal Iodine
is the equivalent of:

	Milligrams
Iodine, I	12.69
Acetone, $(CH_3)_2CO$	0.968
Antimony and Potassium Tartrate, hydrated, $K(SbO)C_4H_4O_6.\frac{1}{2}H_2O$	16.70
Arsenic, in arsenous compounds, As	3.746
Arsenic Trioxide (Arsenous Acid), As_2O_3	4.946
Arsenous Iodide, AsI_3	22.79
Ascorbic Acid, $C_6H_8O_6$	8.806
Hydrogen Sulfide, H_2S	1.704
Iron, Fe	5.585
Mercurous Chloride, HgCl	23.61
Mercurous Iodide, HgI	32.75
Mercury (in mercurous compounds), Hg	20.06
Methylene Blue, anhydrous, $C_{16}H_{18}ClN_3S$	5.331
Sodium Bisulfite, $NaHSO_3$	5.204
Sodium Cacodylate, anhydrous, $Na(CH_3)_2AsO_2$	7.999
Sodium Sulfite, anhydrous, Na_2SO_3	6.303
Sodium Thiosulfate, anhydrous, $Na_2S_2O_3$	15.81
Sodium Thiosulfate, hydrated, $Na_2S_2O_3.5H_2O$	24.82
Sulfur Dioxide, SO_2	3.203

Oxalic Acid, Tenth-Normal

$H_2C_2O_4.2H_2O = 126.07$ 6.3035 Gm. in 1000 cc.

Dissolve 6.45 Gm. of reagent oxalic acid in sufficient water to measure 1000 cc. Ascertain its normality by titration against freshly standardized tenth-normal potassium permanganate as directed under Tenth-Normal Potassium Permanganate, page 861, and, if desired, adjust to exactly tenth-normal.

Preserve in glass-stoppered bottles, protected from light.

One cubic centimeter of Tenth-Normal Oxalic Acid
is the equivalent of:

	Milligrams
Oxalic Acid, hydrated, $H_2C_2O_4.2H_2O$	6.304
Lead, Pb	10.36
Lead Acetate, anhydrous, $Pb(C_2H_3O_2)_2$	16.27
Lead Acetate, hydrated, $Pb(C_2H_3O_2)_2.3H_2O$	18.97
Lead Monoxide, PbO	11.16
Potassium Permanganate, $KMnO_4$	3 161

Oxalic Acid, Hundredth-Normal

One cubic centimeter of Hundredth-Normal Oxalic Acid is the equivalent of:

	Milligrams
Oxalic Acid, hydrated, $H_2C_2O_4 . 2H_2O$	0.6304

Potassium Arsenite, Tenth-Normal

$KAsO_2$ = 146.01 — 7.3005 Gm. in 1000 cc.

Dissolve 4.9455 Gm. of reagent arsenic trioxide, which has been pulverized and dried to constant weight at 100°, in 75 cc. of normal potassium hydroxide. Add 40 Gm. of potassium bicarbonate, dissolved in about 200 cc. of water, and dilute with water to exactly 1000 cc. at 25°.

One cubic centimeter of Tenth-Normal Potassium Arsenite is the equivalent of:

	Milligrams
Iodine, I	12.69
Arsenic Trioxide, As_2O_3	4.946

Potassium Bromate, Tenth-Normal

$KBrO_3$ = 167.01 — 2.784 Gm. in 1000 cc.

Dissolve 2.8 Gm. of reagent potassium bromate in sufficient water to measure 1000 cc., and standardize the solution as follows:

Transfer an accurately measured volume of about 40 cc. of the solution to a glass-stoppered flask, add 3 Gm. of potassium iodide, and follow with 3 cc. of hydrochloric acid. Allow to stand for 5 minutes, then titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. toward the end as the indicator. Correct for blank made with the same quantities of the same reagents.

One cubic centimeter of Tenth-Normal Potassium Bromate is the equivalent of:

	Milligrams
Potassium Bromate, $KBrO_3$	2.784
Arsenic, As	3.746
Dichlorophenarsine Hydrochloride, $C_6H_6NOAsCl_2 . HCl$	14.52
Oxophenarsine Hydrochloride, $C_6H_6O_2NAs . HCl$	11.78

Potassium Dichromate, Tenth-Normal

$K_2Cr_2O_7$ = 294.21 — 4.9035 Gm. in 1000 cc.

Method I. Dissolve 4.9035 Gm. of reagent potassium dichromate, which has been pulverized and dried to constant weight at 120°, in sufficient water to measure exactly 1000 cc. at standard temperature.

Method II. Dissolve about 5 Gm. of reagent potassium dichromate in 1000 cc. of water, transfer exactly 25 cc. of this solution to a 500-cc. glass-stoppered flask, add 2 Gm. of potassium iodide (free from iodate), dilute with 200 cc. of water, add 5 cc. of hydrochloric acid, allow to stand for 10 minutes in a dark place, and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. near the end of the titration as the indicator.

One cubic centimeter of Tenth-Normal Potassium Dichromate is the equivalent of:

	Milligrams
Potassium Dichromate, $K_2Cr_2O_7$	4.904
Ferrous Carbonate, $FeCO_3$	11.59
Ferrous Sulfate, anhydrous, $FeSO_4$	15.19
Ferrous Sulfate, hydrated, $FeSO_4.7H_2O$	27.80
Iron, in ferrous compounds, Fe	5.585
Lead Acetate, anhydrous, $Pb(C_2H_3O_2)_2$	10.84
Lead Monoxide, PbO	7.440
Quinacrine (base), $C_{23}H_{30}ClN_3O$	6.666
Quinacrine Hydrochloride, anhydrous, $C_{23}H_{30}ClN_3O.2HCl$	7.882
Quinacrine Hydrochloride, $C_{23}H_{30}ClN_3O.2HCl.2H_2O$	8.482

Potassium Ferricyanide, Twentieth-Molar

$K_3Fe(CN)_6$ = 329.25 16.462 Gm. in 1000 cc.

Dissolve about 17 Gm. of reagent potassium ferricyanide in sufficient water to make 1000 cc. Transfer 50 cc. of this solution to a 500-cc. glass-stoppered flask, dilute with 50 cc. of water, add 10 cc. of potassium iodide T.S., 10 cc. of diluted hydrochloric acid, and allow to stand for 1 minute. Then add 15 cc. of zinc sulfate solution (1 in 10), and titrate the liberated iodine with tenth-normal sodium thiosulfate, using starch T.S. as the indicator toward the end. Each cc. of tenth-normal sodium thiosulfate corresponds to 2 cc. of twentieth-molar potassium ferricyanide.

Protect the solution from light, and restandardize before use.

One cubic centimeter of Twentieth-Molar Potassium Ferricyanide is the equivalent of:

	Milligrams
Potassium Ferricyanide, $K_3Fe(CN)_6$	16.46
Benzalkonium Chloride	55

Potassium Hydroxide, Normal

KOH = 56.10 56.10 Gm. in 1000 cc.

Normal Potassium Hydroxide is used only as an alternative solution. It is prepared and standardized in exactly the same manner as normal sodium hydroxide, using an equivalent quantity of the potassium hydroxide for preparing the solution. The factors for this solution are the same as for normal sodium hydroxide.

Potassium Hydroxide, Alcoholic, Half-Normal

Dissolve about 35 Gm. of potassium hydroxide in 20 cc. of water and add sufficient aldehyde-free alcohol to make 1000 cc. Allow the solution to stand in a tightly stoppered bottle (using either a glass or a rubber stopper) for 24 hours. Then quickly decant the clear supernatant liquid into a bottle provided with a well-fitting rubber stopper, and standardize as follows:

Measure accurately, from a burette, about 25 cc. of half-normal hydrochloric acid. Dilute with 50 cc. of water, add 2 drops of phenolphthalein T.S., and titrate with the alcoholic potassium hydroxide solution until a permanent, pale pink color is produced. Calculate the normality.

NOTE—Keep this solution in tightly stoppered bottles protected from light. It should be standardized at the same temperature at which it is used.

One cubic centimeter of Half-Normal Alcoholic Potassium Hydroxide is the equivalent of:

	Milligrams
Potassium Hydroxide, KOH	28.05
Benzaldehyde, $C_6H_5.CHO$	53.06
Borneol, $C_{10}H_{17}OH$	77.12
Bornyl Acetate, $C_{10}H_{17}C_2H_3O_2$	98.14
Glyceryl Triacetate, $C_9H_{14}O_6$	36.37
Linalyl Acetate, $C_{10}H_{17}C_2H_3O_2$	98.14
Menthol, $C_{10}H_{19}OH$	78.13
Menthyl Acetate, $C_{10}H_{19}C_2H_3O_2$	99.15
Methyl Salicylate, $HOC_6H_4COOCH_3$	76.07
Santalol, $C_{15}H_{24}O$	110.2

Potassium Hydroxide, Alcoholic, Tenth-Normal

Prepare as described under Potassium Hydroxide, Alcoholic, Half-Normal, using about 7 Gm. of potassium hydroxide, and standardize the solution with tenth-normal hydrochloric acid.

One cubic centimeter of Tenth-Normal Alcoholic Potassium Hydroxide is the equivalent of:

	Milligrams
Potassium Hydroxide, KOH	5.610
Neocinchophen, $C_{19}H_{17}O_2N$	29.13

Potassium Iodate, Twentieth-Molar

$KIO_3 = 214.02$ 10.701 Gm in 1000 cc.

Dissolve 10.701 Gm. of reagent potassium iodate, previously dried to constant weight at 110°, in sufficient water to make 1000 cc. at 25°.

One cubic centimeter of Twentieth-Molar Potassium Iodate is the equivalent of:

	Milligrams
Potassium Iodide, KI	16.60
Sodium Iodide, NaI	14.99
Iodine, I	12.69

Potassium Iodate, Sixtieth-Molar

Dissolve 3.567 Gm. of reagent potassium iodate, previously dried to constant weight at 110°, in sufficient water to make 1000 cc. at 25°.

Potassium Permanganate, Tenth-Normal

$KMnO_4$ = 158 03 — 3.161 Gm. in 1000 cc.

Dissolve about 3 3 Gm. of potassium permanganate in 1000 cc. of water in a flask and boil the solution for about 15 minutes. Stopper the flask and allow it to stand for at least 2 days before filtering through asbestos Ascertain its exact normality by titration against reagent sodium oxalate as follows:

Weigh accurately about 200 mg. of reagent sodium oxalate, previously dried to constant weight at 110°, and dissolve it in 250 cc of water Add 7 cc of sulfuric acid, heat to about 70°, and then slowly add the permanganate solution from a burette, with constant stirring, until a pale pink color is produced which persists for 15 seconds. The temperature at the conclusion of the titration should not be less than 60°. Calculate the normality of the solution and, if desired, adjust the solution exactly to tenth-normal

Burettes provided with glass stopcocks must be employed when titrating with this solution. It should be frequently restandardized. Preserve it in glass-stoppered, amber-colored bottles

One cubic centimeter of Tenth-Normal Potassium Permanganate is the equivalent of

	Milligrams
Potassium Permanganate, $KMnO_4$	3 161
Calcium Bromide, anhydrous, $CaBr_2$	9 996
Calcium Carbonate, $CaCO_3$	5 005
Calcium Chloride, anhydrous, $CaCl_2$	5 55
Calcium Hydroxide, $Ca(OH)_2$	3 705
Calcium Lactate, $Ca(C_3H_5O_3)_2$	10 91
Calcium Mandelate, $(C_6H_5 CHOH COO)_2Ca$	17.12
Calcium Oxide, CaO	2 804
Calcium Phosphate, Dibasic, $CaHPO_4$ $2H_2O$	8 605
Ferrous Carbonate, $FeCO_3$	11 59
Ferrous Sulfate, anhydrous, $FeSO_4$	15 19
Ferrous Sulfate, hydrated, $FeSO_4$ $7H_2O$	27 80
Hydrogen Peroxide, H_2O_2	1 701
Iron, in ferrous compounds, Fe	5 585
Lead Dioxide, PbO_2	11 96
Oxygen, O	0 8
Potassium Chlorate, $KClO_3$	2 043
Sodium Nitrite, $NaNO_2$	3 451
Sodium Oxalate, $Na_2C_2O_4$	6 701
Zinc Peroxide, ZnO_2	4 869

Potassium Permanganate, Hundredth-Normal

One cubic centimeter of Hundredth-Normal Potassium Permanganate is the equivalent of·

	Milligrams
Potassium Permanganate, $KMnO_4$	0 3161

	Milligrams
Calcium, Ca	0.2004
Calcium Chloride, $CaCl_2.2H_2O$	0.7352
Calcium Oxide, CaO	0.2804

Silver Nitrate, Tenth-Normal

$AgNO_3$ = 169.89 16.989 Gm. in 1000 cc.

Method I. Dissolve 17.006 Gm. of reagent silver nitrate, previously dried at 110°, in sufficient water to make 1000 cc. at 25°.

Method II. Dissolve about 17.5 Gm. of silver nitrate in 1000 cc. of water and standardize the solution as follows:

Measure accurately, from a burette, about 40 cc. of the silver nitrate solution and dilute with about 100 cc. of water. Heat the solution and add slowly, with continuous stirring, diluted hydrochloric acid until precipitation of the silver is complete. Boil the mixture cautiously for about 5 minutes, then allow it to stand in the dark until the precipitate has settled and the supernatant liquid has become clear.

Transfer the precipitate completely to a tared filtering crucible, and wash it with small portions of water, slightly acidified with nitric acid. Dry the precipitate to constant weight at 110°. From the weight of the silver chloride obtained calculate the normality of the silver nitrate solution and, if desired, adjust it exactly to tenth-normal. The silver chloride should be protected from light as much as possible during the determination.

One cubic centimeter of Tenth-Normal Silver Nitrate is the equivalent of:

	Milligrams
Silver Nitrate, $AgNO_3$	16.99
Allyl Isothiocyanate, C_3H_5NCS	4.958
Ammonium Bromide, NH_4Br	9.796
Ammonium Chloride, NH_4Cl	5.350
Bromine, Br	7.992
Calcium Bromide, anhydrous, $CaBr_2$	9.996
Calcium Bromide, dihydrate, $CaBr_2.2H_2O$	11.80
Calcium Chloride, anhydrous, $CaCl_2$	5.550
Calcium Chloride, dihydrate, $CaCl_2.2H_2O$	7.352
Chlorine, Cl	3.546
Chlorobutanol, $C_4H_7OCl_3$	5.916
Chloroform, $CHCl_3$	3.980
Ferrous Iodide, FeI_2	15.48
Hydrocyanic Acid, HCN, potassium chromate as indicator	2.703
Hydrocyanic Acid, HCN, to first formation of precipitate	5.405
Hydrogen Iodide, HI	12.79
Iodine, I	12.69
o-Methoxycinnamic Aldehyde, $C_{10}H_{10}O_2$	16.22
Potassium Bromide, KBr	11.90
Potassium Chloride, KCl	7.455
Potassium Iodide, KI	16.60
Potassium Nitrate, KNO_3	10.11

	Milligrams
Sodium Bromide, NaBr	10.29
Sodium Chloride, NaCl	5.845
Sodium Iodide, NaI	14.99
Sodium Nitrite, $NaNO_2$, by chlorate method	20.70
Theophylline, $C_7H_8N_4O_2.H_2O$	19.82
Theophylline, anhydrous, $C_7H_8N_4O_2$	18.02
Tribromoethanol, $C_2H_3Br_3O$	9.426
Zinc Chloride, $ZnCl_2$	6.815

Silver Nitrate, Hundredth-Normal

To exactly 10 cc. of tenth-normal silver nitrate add 1 drop of nitric acid, dilute with sufficient water to make 100 cc., and mix thoroughly.

One cubic centimeter of Hundredth-Normal Silver Nitrate is the equivalent of:

	Milligrams
Silver Nitrate, $AgNO_3$	1.699
Chlorine, Cl	0.3546
Silver, Ag	1.079

Sodium Hydroxide, Normal

NaOH = 40.01 40.01 Gm. in 1000 cc.

Dissolve 45 Gm. of sodium hydroxide in about 950 cc. of water. Add a freshly prepared saturated solution of reagent barium hydroxide until no more precipitate forms. Shake the mixture thoroughly and allow it to stand over night in a stoppered bottle. Decant the clear liquid or filter the solution and standardize it by one of the following methods:

Method I. Accurately measure 30 cc. of normal hydrochloric or normal sulfuric acid, dilute with 50 cc. of carbon dioxide-free water, add 2 drops of phenolphthalein T.S., and titrate with the sodium hydroxide solution to the production of a permanent pink color. Calculate the normality of the sodium hydroxide solution and, if desired, adjust it exactly to normal with freshly boiled and cooled water.

Method II. Dry about 5 Gm. of reagent potassium biphthalate at 100° for 3 hours and weigh accurately. If the potassium biphthalate is in the form of large crystals, they should be crushed before drying. Dissolve it in 75 cc. of carbon dioxide-free water, add 2 drops of phenolphthalein T.S., and titrate with the sodium hydroxide solution to the production of a permanent pink color. Calculate the normality of the sodium hydroxide solution and, if desired, adjust exactly to normal with freshly boiled and cooled water.

NOTE—Solutions of alkali hydroxides absorb carbon dioxide when exposed to air. They should, therefore, be preserved in bottles with well-fitted, suitable stoppers, provided with a tube filled with a mixture of sodium hydroxide and lime (soda-lime tubes) so that air entering the container must pass through this tube, which will absorb the carbon dioxide.

Standard solutions of sodium hydroxide should be frequently restandardized.

One cubic centimeter of Normal Sodium Hydroxide is the equivalent of:

	Milligrams
Sodium Hydroxide, $NaOH$	40.01
Acetic Acid, $HC_2H_3O_2$	60.05
Acetic Anhydride, $(CH_3CO)_2O$	51.04
Ammonium Acetate, $NH_4C_2H_3O_2$	77.08
Boric Acid, H_3BO_3	61.84
Calcium Phosphate, Tribasic, $Ca_3(PO_4)_2$	6.745
Chloral Hydrate, $C_2H_3Cl_3O_2$	165.4
Citric Acid, $H_3C_6H_5O_7.H_2O$	70.05
Formaldehyde, $HCHO$	30.03
Glyceryl Borate (Boroglycerin), $C_3H_5BO_3$	99.89
Hydrogen Chloride, HCl	36.47
Hypophosphorous Acid, HPH_2O_2	66.00
Lactic Acid, $HC_3H_5O_3$	90.08
Magnesium Phosphate, Tribasic, anhydrous, $Mg_3(PO_4)_2$	5.717
Nitric Acid, HNO_3	63.02
Oxalic Acid, hydrated, $H_2C_2O_4.2H_2O$	63.04
Paraformaldehyde, $(HCHO)_3$	30.03
Phosphoric Acid, H_3PO_4 (to form Na_2HPO_4 with phenolphthalein)	49.00
Potassium Biphthalate, $KHC_6H_4(COO)_2$	204.2
Potassium Bitartrate, $KHC_4H_4O_6$	188.2
Potassium Hydroxide, KOH	56.10
Sodium Biphosphate, $NaH_2PO_4.H_2O$	138.0
Sodium Biphosphate, anhydrous, NaH_2PO_4	120.0
Sodium Bitartrate, $NaHC_4H_4O_6.H_2O$	190.1
Sulfuric Acid, H_2SO_4	49.04
Sulfur Trioxide, SO_3	40.03
Tartaric Acid, $H_2C_4H_4O_6$	75.05
Trichloroacetic Acid, $CCl_3.COOH$	163.4

Sodium Hydroxide, Half-Normal

Preserve as directed under normal sodium hydroxide, page 863. This solution should be frequently restandardized.

One cubic centimeter of Half-Normal Sodium Hydroxide is the equivalent of:

	Milligrams
Sodium Hydroxide, $NaOH$	20.005
Acetylsalicylic Acid, $C_9H_8O_4$ (By U. S. P. assay)	45.04
Aluminum Phosphate, $AlPO_4$	2.654

Sodium Hydroxide, Tenth-Normal

Preserve as directed under normal sodium hydroxide, page 863. This solution should be frequently restandardized.

One cubic centimeter of Tenth-Normal Sodium Hydroxide is the equivalent of:

	Milligrams
Sodium Hydroxide, $NaOH$	4.001
Acetylsalicylic Acid, $C_9H_8O_4$	18.02
Benzoic Acid, $C_7H_6O_2$	12.21
Boric Acid, H_3BO_3	6.184
Citric Acid, $H_3C_6H_5O_7.H_2O$	7.005
Eucaine Hydrochloride, $C_{15}H_{21}O_2N.HCl$	28.38
Mandelic Acid, $C_8H_8O_3$	15 21
Nicotinic Acid, $C_6H_5O_2N$	12.31
Potassium Biphthalate, $KHC_6H_4(COO)_2$	20.42
Salicylic Acid, $C_7H_6O_3$	13.81
Sodium Salicylate, $NaC_7H_5O_3$	16.01

Sodium Hydroxide, Twentieth-Normal

Preserve as directed under normal sodium hydroxide, page 863. This solution should be frequently restandardized.

One cubic centimeter of Twentieth-Normal Sodium Hydroxide is the equivalent of:

	Milligrams
Sodium Hydroxide, $NaOH$	2.001

Sodium Hydroxide, Fiftieth-Normal

Preserve as directed under normal sodium hydroxide, page 863. This solution should be frequently restandardized.

One cubic centimeter of Fiftieth-Normal Sodium Hydroxide is the equivalent of:

	Milligrams
Sodium Hydroxide, $NaOH$	0.8002

Sodium Hydroxide, Hundredth-Normal

Preserve as directed under normal sodium hydroxide, page 863. This solution should be frequently restandardized.

One cubic centimeter of Hundredth-Normal Sodium Hydroxide is the equivalent of:

	Milligrams
Sodium Hydroxide, $NaOH$	0.4001

Sodium Nitrite, Tenth-Molar

$NaNO_2 = 69.01$ 6.901 Gm. in 1000 cc.

Dissolve 7.5 Gm. of sodium nitrite in sufficient water to measure 1000 cc. and standardize as follows:

Weigh accurately about 500 mg. of U. S. P. Sulfanilamide Reference Standard, previously dried for 3 hours at 100°, and transfer it to a beaker or casserole. Add 50 cc. of water and 5 cc. of hydrochloric acid, and stir well until dissolved. Cool to

15°, and add about 25 Gm. of crushed ice, then titrate slowly with the sodium nitrite solution, stirring vigorously, until a blue color is produced immediately when a glass rod dipped in the titrated solution is streaked on a smear of starch iodide paste T.S. When the titration is complete, the end-point should be reproducible after the mixture has been standing for 1 minute.

One cubic centimeter of Tenth-Molar Sodium Nitrite is the equivalent of:

	Milligrams
Sodium Nitrite, $NaNO_2$	6.901
Succinylsulfathiazole, $C_{13}H_{13}N_3O_5S_2$	35.54
Sulfadiazine, $C_{10}H_{10}N_4O_2S$	25.03
Sulfadiazine Sodium, $C_{10}H_9N_4O_2SNa$	27.23
Sulfaguanidine, $C_7H_{10}N_4O_2S$	21.42
Sulfamerazine, $C_{11}H_{12}N_4O_2S$	26.43
Sulfamerazine Sodium, $C_{11}H_{11}N_4O_2SNa$	28.63
Sulfanilamide, $C_6H_8O_2N_2S$	17.22
Sulfapyridine, $C_{11}H_{11}N_3O_2S$	24.93
Sulfapyridine Sodium, anhydrous, $C_{11}H_{10}N_3O_2SNa$	27.13
Sulfathiazole, $C_9H_9N_3O_2S_2$	25.53
Sulfathiazole Sodium, $C_9H_8N_3O_2S_2Na$	27.73

Sodium Thiosulfate, Tenth-Normal

$Na_2S_2O_3.5H_2O$ = 248.19 24.819 Gm. in 1000 cc.

Dissolve about 26 Gm. of sodium thiosulfate and 200 mg. of sodium carbonate in 1000 cc. of recently boiled and cooled water.

Standardize the solution by titration against tenth-normal iodine, or against tenth-normal potassium dichromate by the following method:

Measure accurately 30 cc. of tenth-normal potassium dichromate into a glass-stoppered flask and dilute it with 50 cc. of water. Add 2 Gm. of potassium iodide and 5 cc. of hydrochloric acid, stopper, and allow to stand for 10 minutes. Dilute with 100 cc. of water and titrate the liberated iodine with the sodium thiosulfate solution. When the solution has assumed a yellowish green color, add starch T.S and continue with the titration to the discharge of the blue color. Calculate the normality of the sodium thiosulfate solution and, if desired, adjust exactly to tenth-normal.

This solution should be frequently restandardized.

One cubic centimeter of Tenth-Normal Sodium Thiosulfate is the equivalent of:

	Milligrams
Sodium Thiosulfate, $Na_2S_2O_3.5H_2O$	**24.82**
Amyl Nitrite, $C_5H_{11}NO_2$	**11.72**
Arsenic, As, in arsphenamine, carbarsone, neoarsphenamine and sulfarsphenamine	**3.746**
Ascaridol, $C_{10}H_{16}O_2$	**6.65**
Bromine, Br	**7.992**
Chlorine, Cl	**3.546**

	Milligrams
Chlorine, Cl, in chloramine-T	1.773
Chromium Trioxide, CrO_3	3.334
Cupric Citrate, $Cu_2C_6H_4O_7.2\frac{1}{2}H_2O$	18.014
Cupric Sulfate, anhydrous, $CuSO_4$	15.96
Cupric Sulfate, hydrated, $CuSO_4.5H_2O$	24.97
Ethyl Nitrite, $C_2H_5NO_2$	7.507
Glyceryl Trinitrate, $C_3H_5(NO_3)_3$	11.35
Iodine, I	12.69
Iron, Fe, in ferric salts	5.585
Potassium Bromate, $KBrO_3$	2.784
Potassium Dichromate, $K_2Cr_2O_7$	4.904
Potassium Iodate, KIO_3	3.567
Sodium Hypochlorite, NaClO	3.723

Sodium Thiosulfate, Hundredth-Normal

Dilute exactly 100 cc. of tenth-normal sodium thiosulfate with sufficient freshly boiled and cooled water to make 1000 cc. This solution should be frequently restandardized.

One cubic centimeter of Hundredth-Normal Sodium Thiosulfate is the equivalent of:

	Milligrams
Iodine, I, in Thyroxin and Thyroid (by U. S. P. XIII method)	0.2116

Sodium Thiosulfate, Two-Hundredth-Normal

Dilute exactly 50 cc. of tenth-normal sodium thiosulfate with sufficient freshly boiled and cooled water to make 1000 cc. This solution should not be used if it has been prepared longer than 7 days.

One cubic centimeter of Two-Hundredth-Normal Sodium Thiosulfate is the equivalent of:

	Milligrams
Sodium Thiosulfate, $Na_2S_2O_3.5H_2O$	1.241
Glyceryl Trinitrate, $C_3H_5(NO_3)_3$	0.5677
Iodine, I	0.6346

Sodium Thiosulfate, Thousandth-Normal

Dilute exactly 10 cc. of tenth-normal sodium thiosulfate with sufficient freshly boiled and cooled water to make 1000 cc. This solution is prepared on the day it is used. Each cc. is equivalent to 0.1269 mg. of iodine (I), and 0.10 mg. of zinc (Zn).

Sulfuric Acid, Normal

H_2SO_4 = 98.08 — 49.04 Gm. in 1000 cc.

Add slowly, with stirring, 30 cc. of sulfuric acid to about 1020 cc. of water, allow to cool to 25°, and determine its normality by titration against sodium carbonate as described under Normal Hydrochloric Acid or gravimetrically as follows:

Measure accurately 20 cc. of the acid into a 500-cc. beaker and dilute with 250 cc. of water. Add 1 cc. of hydrochloric acid, heat to boiling, and add gradually, with

continuous stirring, hot barium chloride T.S. until precipitation is complete. Heat the mixture on a water bath for 1 hour. Collect the precipitate on a filter, wash with hot water until free of chloride, dry, and ignite to constant weight. From the weight of the barium sulfate thus obtained, calculate the normality of the solution and, if desired, adjust exactly to normal.

One cubic centimeter of Normal Sulfuric Acid is the equivalent of:

	Milligrams
Sulfuric Acid, H_2SO_4	49 04
Ammonia Gas, NH_3	17 03
Ammonium Acetate, $NH_4C_2H_3O_2$	77 08
Calcium Oxide, CaO	28 04
Magnesium Hydroxide, $Mg(OH)_2$	29 17
Magnesium Oxide, MgO	20 16
Methenamine, $(CH_2)_6N_4$	35 05
Potassium Acetate, $KC_2H_3O_2$	98 14
Potassium Bicarbonate, $KHCO_3$	100 1
Potassium Carbonate, anhydrous, K_2CO_3, methyl orange as indicator	69 10
Potassium Carbonate, anhydrous, K_2CO_3, phenolphthalein as indicator	138 2
Potassium Hydroxide, KOH	56 10
Sodium Bicarbonate, $NaHCO_3$	84 02
Sodium Borate, hydrated, $Na_2B_4O_7$ $10H_2O$	190 7
Sodium Carbonate, anhydrous, Na_2CO_3, methyl orange as indicator	53 00
Sodium Carbonate, anhydrous, Na_2CO_3, phenolphthalein as indicator	106 0
Sodium Carbonate, monohydrated, Na_2CO_3 H_2O, methyl orange as indicator.....	62 01
Sodium Hydroxide, NaOH	40 01
Zinc Oxide, ZnO	40 69

Sulfuric Acid, Half-Normal

One cubic centimeter of Half-Normal Sulfuric Acid is the equivalent of:

	Milligrams
Sulfuric Acid, H_2SO_4	24 52
Ammonia Gas, NH_3	8 516
Ammonium Carbonate, $(NH_4)_2CO_3$	24 03
Benzaldehyde, C_6H_5CHO	53 06
Citral, $C_{10}H_{16}O$....	76 12
Nitrogen, N	7 004
Potassium Acetate, $KC_2H_3O_2$	49 07
Potassium Citrate, anhydrous, $K_3C_6H_5O_7$....	51 07
Potassium Hydroxide, KOH	28 05
Potassium Sodium Tartrate, anhydrous, $KNaC_4H_4O_6$ ...	52 54

	Milligrams
Sodium Acetate, anhydrous, $NaC_2H_3O_2$	41.02
Sodium Benzoate, $NaC_7H_5O_2$	72.06
Sodium Borate, anhydrous, $Na_2B_4O_7$	50.32
Sodium Borate, hydrated, $Na_2B_4O_7.10H_2O$	95.36
Sodium Citrate, anhydrous, $Na_3C_6H_5O_7$	43.02
Sodium Salicylate, $NaC_7H_5O_3$	80.05

Sulfuric Acid, Tenth-Normal

One cubic centimeter of Tenth-Normal Sulfuric Acid is the equivalent of:

	Milligrams
Sulfuric Acid, H_2SO_4	4.904
Ammonia, NH_3	1.703
Atropine, $C_{17}H_{23}O_3N$	28.94
Calcium Hydroxide, $Ca(OH)_2$	3.705
Codeine, $C_{18}H_{21}O_3N$	29.94
Dimethylamine, $(CH_3)_2NH$	4.508
Emetine Hydrochloride, anhydrous, $C_{29}H_{40}N_2O_4.2HCl$	27.68
Ephedrine, $C_{10}H_{15}NO$	16.52
Ipecac, ether-soluble alkaloids	24.03
Morphine, anhydrous, $C_{17}H_{19}O_3N$	28.53
Neostigmine Bromide, $C_{12}H_{19}N_2O_2Br$	30.32
Nicotinamide, $C_6H_6N_2O$	12.21
Nitrogen, N	1.4008
Potassium Hydroxide, KOH	5.601
Saccharin Sodium, $C_7H_4O_3NSNa.2H_2O$	24.12
Sodium Hydroxide, NaOH	4.001
Sodium Lactate, $NaC_3H_5O_3$	11.20
Sodium Morrhuate	32.4
Strychnine, $C_{21}H_{22}N_2O_2$	33.44
Urethane, $C_3H_7NO_2$	8.909
Zinc Oxide, ZnO	4.069

Sulfuric Acid, Fiftieth-Normal

One cubic centimeter of Fiftieth-Normal Sulfuric Acid is the equivalent of:

	Milligrams
Sulfuric Acid, H_2SO_4	0.9808
Apomorphine Hydrochloride, $C_{17}H_{17}ON.HCl.{}^1/{}_2H_2O$	6.256
Atropine Sulfate, $(C_{17}H_{23}O_3N)_2.H_2SO_4.H_2O$	6.498
Belladonna, combined alkaloids	5.787
Codeine Phosphate, $C_{18}H_{21}O_3N.H_3PO_4.1{}^1/{}_2H_2O$	8.488
Codeine Sulfate, $(C_{18}H_{21}O_3N)_2.H_2SO_4.5H_2O$	7.869
Dihydromorphinone Hydrochloride, $C_{17}H_{19}O_3N.HCl$	6.436
Emetine Hydrochloride, anhydrous, $C_{29}H_{40}N_2O_4.2HCl$	5.536
Ephedrine Sulfate, $(C_{10}H_{15}NO)_2.H_2SO_4$	4.285
Ergonovine Maleate, $C_{19}H_{23}N_3O_2.C_4H_4O_4$	8.829

	Milligrams
Glyceryl Trinitrate, $C_3H_5(NO_3)_3$	1.514
Hyoscyamus, combined alkaloids	5.787
Morphine, anhydrous, $C_{17}H_{19}O_3N$	5.707
Morphine Hydrochloride, $C_{17}H_{19}O_3N.HCl.3H_2O$	7.517
Morphine Hydrochloride, anhydrous, $C_{17}H_{19}O_3N.HCl$	6.436
Morphine Sulfate, $(C_{17}H_{19}O_3N)_2.H_2SO_4.5H_2O$	7.588
Morphine Tartrate, $(C_{17}H_{19}O_3N)_2.C_4H_6O_6.3H_2O$	7.748
Morphine Tartrate, anhydrous, $(C_{17}H_{19}O_3N)_2.C_4H_6O_6$	7.208
Neostigmine Methylsulfate, $C_{13}H_{22}N_2O_6S$	6.685
Stramonium, combined alkaloids	5.787
Strychnine Sulfate, $(C_{21}H_{22}N_2O_2)_2.H_2SO_4.5H_2O$	8.570

pH Measurements

In the determination of an unknown pH value, a suitable indicator must first be found. Only indicators which show an intermediate color between the extreme acid and alkaline colors can be used.

The first step in the choice of a suitable indicator is the determination of the approximate pH value of the solution under investigation. A few simple tests will usually supply the necessary information. Add a drop or two of phenolphthalein T.S. to a small portion of the solution. If the indicator remains colorless, the pH of the solution is less than 8.4. A second test is conducted in the same manner, using methyl orange T.S. as the indicator. If the solution assumes the alkaline color (yellow), the pH of the solution is greater than 4.4 and lies somewhere between 4.4 and 8.4. A few more tests with methyl red (pH interval 4.2–6.3), bromothymol blue (6.0–7.6), and phenol red (6.8–8.4) will give a close enough approximation of the pH value to show which indicator may be successfully used in the determination.

Instead of testing small amounts of the liquid with indicator solutions, the spot method, using indicator papers, may be substituted. Also, by using a universal indicator in place of the several indicator solutions suggested above, some time may be saved.

When the approximate pH value has been determined and a suitable indicator agreed upon, a 3-, 5-, or 10-cc. portion of the unknown solution (depending upon the amount of the liquid available), is transferred to a hard, resistant glass test tube approximately 15 cm. long and 1.5 cm. ± 0.5 mm. bore, and a measured amount of the indicator solution added. As a rule, 0.10 to 0.20 cc. of a 0.05 per cent indicator solution, added from a 1-cc. pipette graduated to 0.01 cc., per 10 cc. of the solution being tested, constitutes a proper indicator concentration.

Transfer from 4 to 6 portions of the buffer solutions, the pH values of which overlap that of the unknown solution, to test tubes and treat in exactly the same way as the solution being analyzed. The same amounts of indicator must be added to the unknown and to the buffer solutions. It is also essential that the test tubes used be of the quality and type already indicated. The color of the unknown solution is then compared with the colors of the buffer solutions and the pH value of the solution thus determined.

In judging the colors, observe them against a white background with the light transmitted through the whole length of the tube. A suitable colorimeter may also

be used, although it is not necessary in routine work. A sufficient number of reference solutions must be taken so that the color of the unknown falls between two of the series, differing by not more than 0.20 pH. The pH of the unknown can thus be easily approximated to within 0.1 and with practice to 0.05. With buffer solutions differing by 0.1 pH unit or less, the experimental error can be reduced to about 0.02 pH.

Other colorimetric methods capable of the same or a greater degree of accuracy than that required by the Pharmacopœia may be employed at the discretion of the operator.

Solutions Used in the Preparation of Buffer Solutions

Fifth-molar hydrochloric acid and fifth-molar sodium hydroxide (carbonate free) are prepared and standardized according to the directions given under *Volumetric Solutions*, page 851.

1. *Potassium Biphthalate Solution* - Dissolve 40.843 Gm. of potassium biphthalate in water and dilute to 1000 cc. to make a fifth-molar solution for preparing the buffer solutions.

2. *Potassium Phosphate, Monobasic, Solution* Dissolve 27.218 Gm. of monopotassium phosphate in water and dilute to 1000 cc. to make a fifth-molar solution for preparing the buffer solutions.

3. *Boric Acid and Potassium Chloride Solution* —Dissolve 12.369 Gm. of boric acid and 14.911 Gm. of potassium chloride in water and dilute to 1000 cc. to prepare a fifth-molar solution of these mixed salts.

4. *Potassium Chloride Solution* —Dissolve 14.911 Gm. of potassium chloride in water and dilute to 1000 cc. to make a fifth-molar solution for preparing the buffer solutions.

5. *Potassium Biphthalate Solution for Hydrogen Electrode*—Solution (1) diluted with three volumes of water at 20° prepares twentieth-molar potassium biphthalate solution for checking the hydrogen electrode.

Buffer Mixtures of Clark and Lubs

HCl-KCl Mixtures

pH			
1.1	94.56 cc. M/5 HCl	5.44 cc. M/5 KCl	Dilute to 200 cc.
1.2	75.10 cc. M/5 HCl	24.90 cc. M/5 KCl	Dilute to 200 cc.
1.3	59.68 cc. M/5 HCl	40.32 cc. M/5 KCl	Dilute to 200 cc.
1.4	47.40 cc. M/5 HCl	52.60 cc. M/5 KCl	Dilute to 200 cc.
1.5	37.64 cc. M/5 HCl	62.36 cc. M/5 KCl	Dilute to 200 cc.
1.6	29.90 cc. M/5 HCl	70.06 cc. M/5 KCl	Dilute to 200 cc.
1.7	23.76 cc. M/5 HCl	76.24 cc. M/5 KCl	Dilute to 200 cc.
1.8	18.86 cc. M/5 HCl	81.14 cc. M/5 KCl	Dilute to 200 cc.
1.9	14.98 cc. M/5 HCl	85.02 cc. M/5 KCl	Dilute to 200 cc.
2.0	11.90 cc. M/5 HCl	88.10 cc. M/5 KCl	Dilute to 200 cc.
2.1	9.46 cc. M/5 HCl	90.54 cc. M/5 KCl	Dilute to 200 cc.
2.2	7.52 cc. M/5 HCl	92.48 cc. M/5 KCl	Dilute to 200 cc.

Phthalate-HCl Mixtures

pH			
2.2	50 cc. M/5 KHPhthalate	46.60 cc. M/5 HCl	Dilute to 200 cc.
2.4	50 cc. M/5 KHPhthalate	39.60 cc. M/5 HCl	Dilute to 200 cc.

Phthalate-HCl Mixtures (Continued)

pH			
2.6	50 cc. M/5 KHPhthalate	33.00 cc. M/5 HCl	Dilute to 200 cc.
2.8	50 cc. M/5 KHPhthalate	26.50 cc. M/5 HCl	Dilute to 200 cc.
3.0	50 cc. M/5 KHPhthalate	20.40 cc. M/5 HCl	Dilute to 200 cc.
3.2	50 cc. M/5 KHPhthalate	14.80 cc. M/5 HCl	Dilute to 200 cc.
3.4	50 cc. M/5 KHPhthalate	9.95 cc. M/5 HCl	Dilute to 200 cc.
3.6	50 cc. M/5 KHPhthalate	6.00 cc. M/5 HCl	Dilute to 200 cc.
3.8	50 cc. M/5 KHPhthalate	2.65 cc. M/5 HCl	Dilute to 200 cc.

Phthalate-NaOH Mixtures

pH			
4.0	50 cc. M/5 KHPhthalate	0.40 cc. M/5 NaOH	Dilute to 200 cc.
4.2	50 cc. M/5 KHPhthalate	3.65 cc. M/5 NaOH	Dilute to 200 cc.
4.4	50 cc. M/5 KHPhthalate	7.35 cc. M/5 NaOH	Dilute to 200 cc.
4.6	50 cc. M/5 KHPhthalate	12.00 cc. M/5 NaOH	Dilute to 200 cc.
4.8	50 cc. M/5 KHPhthalate	17.50 cc. M/5 NaOH	Dilute to 200 cc.
5.0	50 cc. M/5 KHPhthalate	23.65 cc. M/5 NaOH	Dilute to 200 cc.
5.2	50 cc. M/5 KHPhthalate	29.75 cc. M/5 NaOH	Dilute to 200 cc.
5.4	50 cc. M/5 KHPhthalate	35.25 cc. M/5 NaOH	Dilute to 200 cc.
5.6	50 cc. M/5 KHPhthalate	39.70 cc. M/5 NaOH	Dilute to 200 cc.
5.8	50 cc. M/5 KHPhthalate	43.10 cc. M/5 NaOH	Dilute to 200 cc.
6.0	50 cc. M/5 KHPhthalate	45.40 cc. M/5 NaOH	Dilute to 200 cc.
6.2	50 cc. M/5 KHPhthalate	47.00 cc. M/5 NaOH	Dilute to 200 cc.

KH_2PO_4-NaOH Mixtures

pH			
5.8	50 cc. M/5 KH_2PO_4	3.66 cc. M/5 NaOH	Dilute to 200 cc.
6.0	50 cc. M/5 KH_2PO_4	5.64 cc. M/5 NaOH	Dilute to 200 cc.
6.2	50 cc. M/5 KH_2PO_4	8.55 cc. M/5 NaOH	Dilute to 200 cc.
6.4	50 cc. M/5 KH_2PO_4	12.60 cc. M/5 NaOH	Dilute to 200 cc.
6.6	50 cc. M/5 KH_2PO_4	17.74 cc. M/5 NaOH	Dilute to 200 cc.
6.8	50 cc. M/5 KH_2PO_4	23.60 cc. M/5 NaOH	Dilute to 200 cc.
7.0	50 cc. M/5 KH_2PO_4	29.54 cc. M/5 NaOH	Dilute to 200 cc.
7.2	50 cc. M/5 KH_2PO_4	34.90 cc. M/5 NaOH	Dilute to 200 cc.
7.4	50 cc. M/5 KH_2PO_4	39.34 cc. M/5 NaOH	Dilute to 200 cc.
7.6	50 cc. M/5 KH_2PO_4	42.74 cc. M/5 NaOH	Dilute to 200 cc.
7.8	50 cc. M/5 KH_2PO_4	45.17 cc. M/5 NaOH	Dilute to 200 cc.
8.0	50 cc. M/5 KH_2PO_4	46.85 cc. M/5 NaOH	Dilute to 200 cc.

Boric Acid, KCl-NaOH Mixtures

pH			
7.8	50 cc. M/5 H_3BO_3, M/5 KCl	2.65 cc. M/5 NaOH	Dilute to 200 cc.
8.0	50 cc. M/5 H_3BO_3, M/5 KCl	4.00 cc. M/5 NaOH	Dilute to 200 cc.
8.2	50 cc. M/5 H_3BO_3, M/5 KCl	5.90 cc. M/5 NaOH	Dilute to 200 cc.
8.4	50 cc. M/5 H_3BO_3, M/5 KCl	8.55 cc. M/5 NaOH	Dilute to 200 cc.
8.6	50 cc. M/5 H_3BO_3, M/5 KCl	12.00 cc. M/5 NaOH	Dilute to 200 cc.
8.8	50 cc. M/5 H_3BO_3, M/5 KCl	16.40 cc. M/5 NaOH	Dilute to 200 cc.
9.0	50 cc. M/5 H_3BO_3, M/5 KCl	21.40 cc. M/5 NaOH	Dilute to 200 cc.
9.2	50 cc. M/5 H_3BO_3, M/5 KCl	26.70 cc. M/5 NaOH	Dilute to 200 cc.
9.4	50 cc. M/5 H_3BO_3, M/5 KCl	32.00 cc. M/5 NaOH	Dilute to 200 cc.
9.6	50 cc. M/5 H_3BO_3, M/5 KCl	36.85 cc. M/5 NaOH	Dilute to 200 cc.

pH	*Boric Acid, KCl-NaOH Mixtures (Continued)*		
9.8	50 cc. M/5 H_3BO_3, M/5 KCl	40.80 cc. M/5 NaOH	Dilute to 200 cc.
10.0	50 cc. M/5 H_3BO_3, M/5 KCl	43.90 cc. M/5 NaOH	Dilute to 200 cc.

Hydrogen-Ion Concentration (pH) of Some Official Substances

The hydrogen-ion concentrations, expressed as pH, of the substances in the following table are given for informative purposes only, and are not intended to be construed as a means for the determination of the purity of these substances. In practice, variations from these figures may frequently be found, as a slight excess of acid or base is, in many instances, desirable and even necessary to insure stability and other qualities in connection with the use of these substances.

When only one figure is given in the table, it represents the theoretical pH, or the one generally agreed upon in the literature. For the majority of the alkali- and alkaline earth-salts, an approximate range is given within which the pH of these substances, as they usually occur on the market, will fall. Some deviations from these values may, however, be expected, as the presence of even a very slight excess of base or acid in these salts, or of carbon dioxide in their solutions, exercises a pronounced influence upon the hydrogen-ion concentration.

Substance	Concentration	pH
Acid Benzoic	Saturated solution	2.8
Acid Boric	0.1 molar	5.1
Acid Citric	0.1 molar	2.1
Acid Hydriodic	0.1 molar	1.0
Acid Hydrochloric	0.1 molar	1.0
Acid Hypophosphorous	0.1 molar	1.5
Acid Salicylic	Saturated solution	2.4
Acid Tartaric	0.1 molar	1.9
Acid Trichloroacetic	0.1 molar	1.2
Alum (Ammonium)	0.05 molar	4.6
Alum (Potassium)	0.1 molar	4.2
Ammonia Water	0.1 molar	11.3
Ammonium Bromide	0.1 molar	4.6
Ammonium Chloride	0.1 molar	4.6
Apomorphine Hydrochloride	1 in 300	4.8
Arsphenamine	1 in 20	3.0
Atropine	Saturated solution	9.5
Atropine Sulfate	1 in 100	5.4
Barbital Sodium	0.1 molar	9.4
Caffeine, Citrated	1 in 25	2.3
Caffeine with Sodium Benzoate	1 in 25	7.4
Calcium Bromide	0.2 molar	7.0–8.0
Calcium Chloride	0.2 molar	6.5–7.5

Substance	Concentration	pH
Calcium Hydroxide	Saturated solution	12.3
Calcium Lactate	1 in 25	6.0–7.0
Cinchonidine Sulfate	Saturated solution	6.4
Cocaine Hydrochloride	0.1 molar	4.5
Codeine Phosphate	0.1 molar	4.5
Codeine Sulfate	0.1 molar	5.0
Emetine Hydrochloride	1 in 50	5.6
Ephedrine	1 in 200	10.8
Ephedrine Hydrochloride	1 in 200	5.9
Homatropine Hydrobromide	1 in 100	5.4
Magnesia Magma		10.6
Magnesium Sulfate	0.2 molar	6.0–7.0
Morphine Sulfate	0.1 molar	4.8
Physostigmine Salicylate	1 in 200	5.8
Pilocarpine Nitrate	1 in 100	4.8
Potassium Acetate	0.1 molar	9.7
Potassium Bicarbonate	0.1 molar	8.2
Potassium Bromide	0.2 molar	6.5–8.0
Potassium Carbonate	0.1 molar	11.6
Potassium Hydroxide	0.1 molar	13.5
Potassium Iodide	0.2 molar	7.0–9.0
Potassium Sodium Tartrate	0.2 molar	7.0–8.0
Procaine Hydrochloride	0.1 molar	6.0
Quinidine Sulfate	1 in 200	6.4
Quinine	Saturated solution	8.8
Quinine Bisulfate	1 in 25	3.5
Quinine Dihydrochloride	1 in 25	2.6
Quinine Hydrobromide	1 in 25	6.4
Quinine Hydrochloride	1 in 25	6.4
Quinine Sulfate	Saturated solution	6.2
Sodium Acetate	0.1 molar	8.9
Sodium Benzoate	0.1 molar	8.0
Sodium Bicarbonate	0.1 molar	8.2
Sodium Biphosphate	0.1 molar	4.5
Sodium Borate	0.1 molar	9.2
Sodium Bromide	0.2 molar	6.5–8.0
Sodium Carbonate	0.1 molar	11.6
Sodium Chloride	0.2 molar	6.7–7.3
Sodium Hydroxide	0.1 molar	13.5
Sodium Iodide	0.2 molar	8.0–9.5
Sodium Phosphate, Dibasic	0.1 molar	9.5
Sodium Salicylate	0.2 molar	5.0–6.0
Sodium Sulfate	0.2 molar	6.0–7.5
Strychnine Nitrate	1 in 250	5.7
Strychnine Sulfate	1 in 100	5.5
Theobromine with Sodium Salicylate	1 in 100	10.3

Atomic Weights

Adopted by the International Committee on Chemical Elements (1941)

Oxygen 16.0000

Name	Symbol	Atomic Number	Atomic Weight	Name	Symbol	Atomic Number	Atomic Weight
Aluminum	Al	13	26.97	Molybdenum	Mo	42	95.95
Antimony	Sb	51	121.76	Neodymium	Nd	60	144.27
Argon	A	18	39.944	Neon	Ne	10	20.183
Arsenic	As	33	74.91	Nickel	Ni	28	58.69
Barium	Ba	56	137.36	Nitrogen	N	7	14.008
Beryllium	Be	4	9.02	Osmium	Os	76	190.2
Bismuth	Bi	83	209.00	Oxygen	O	8	16.0000
Boron	B	5	10.82	Palladium	Pd	46	106.7
Bromine	Br	35	79.916	Phosphorus	P	15	30.98
Cadmium	Cd	48	112.41	Platinum	Pt	78	195.23
Calcium	Ca	20	40.08	Potassium	K	19	39.096
Carbon	C	6	12.010	Praseodymium	Pr	59	140.92
Cerium	Ce	58	140.13	Protoactinium	Pa	91	231
Cesium	Cs	55	132.91	Radium	Ra	88	226.05
Chlorine	Cl	17	35.457	Radon	Rn	86	222
Chromium	Cr	24	52.01	Rhenium	Re	75	186.31
Cobalt	Co	27	58.94	Rhodium	Rh	45	102.91
Columbium	Cb	41	92.91	Rubidium	Rb	37	85.48
Copper	Cu	29	63.57	Ruthenium	Ru	44	101.7
Dysprosium	Dy	66	162.46	Samarium	Sm	62	150.43
Erbium	Er	68	167.2	Scandium	Sc	21	45.10
Europium	Eu	63	152.0	Selenium	Se	34	78.96
Fluorine	F	9	19.00	Silicon	Si	14	28.06
Gadolinium	Gd	64	156.9	Silver	Ag	47	107.880
Gallium	Ga	31	69.72	Sodium	Na	11	22.997
Germanium	Ge	32	72.60	Strontium	Sr	38	87.63
Gold	Au	79	197.2	Sulfur	S	16	32.06
Hafnium	Hf	72	178.6	Tantalum	Ta	73	180.88
Helium	He	2	4.003	Tellurium	Te	52	127.61
Holmium	Ho	67	164.94	Terbium	Tb	65	159.2
Hydrogen	H	1	1.0080	Thallium	Tl	81	204.39
Indium	In	49	114.76	Thorium	Th	90	232.12
Iodine	I	53	126.92	Thulium	Tm	69	169.4
Iridium	Ir	77	193.1	Tin	Sn	50	118.70
Iron	Fe	26	55.85	Titanium	Ti	22	47.90
Krypton	Kr	36	83.7	Tungsten	W	74	183.92
Lanthanum	La	57	138.92	Uranium	U	92	238.07
Lead	Pb	82	207.21	Vanadium	V	23	50.95
Lithium	Li	3	6.940	Xenon	Xe	54	131.3
Lutecium	Lu	71	174.99	Ytterbium	Yb	70	173.04
Magnesium	Mg	12	24.32	Yttrium	Y	39	88.92
Manganese	Mn	25	54.93	Zinc	Zn	30	65.38
Mercury	Hg	80	200.61	Zirconium	Zr	40	91.22

Atomic and Molecular Weights

Acetanilid	$C_6H_5NHCOCH_3$	135.16
Acetarsone (3-Acetamino-4-hydroxy-		
phenylarsonic Acid)	$CH_3CONHC_6H_3(OH)AsO(OH)_2$	275.08
Acetic Acid	CH_3COOH	60.05
" Anhydride	$(CH_3CO)_2O$	102.09
" Ether (see Ethyl Acetate)		
Acetone (Dimethyl Ketone)	CH_3COCH_3	58.08
Acetophenetidin (Acetphenetidin,		
Phenacetin)	$C_2H_5OC_6H_4NHCOCH_3$	179.21
Acetyl Chloride	CH_3COCl	78.50
Acetyl-β-methylcholine Chloride (see Methacholine Chloride)		
Acetylcholine Chloride	$[CH_3COOCH_2CH_2N(CH_3)_3]Cl$	181.66
Acetylsalicylic Acid (Aspirin)	$CH_3COOC_6H_4COOH$	180.15
Aconitine	$C_{34}H_{47}NO_{11}$	645.72
Adenine Sulfate	$(C_5H_5N_5)_2 . H_2SO_4 . 2H_2O$	404.38
" " anhydrous	$(C_5H_5N_5)_2 . H_2SO_4$	368.35
Alcohol (Ethanol, Ethyl Alcohol)	C_2H_5OH	46.07
Alizarin Red S (see Sodium Alizarinsulfonate)		
Allyl Isothiocyanate (Mustard Oil)	$CH_2: CHCH_2NCS$	99.15
Alum (see Aluminum and Ammonium Sulfate, and Aluminum and Potassium Sulfate)		
Aluminum	Al	26.97
Aluminum and Ammonium Sulfate		
(Ammonium Alum)	$AlNH_4(SO_4)_2 . 12H_2O$	453.32
" and Ammonium Sulfate		
anhydrous	$AlNH_4(SO_4)_2$	237.13
" and Potassium Sulfate		
(Potassium Alum)	$AlK(SO_4)_2 . 12H_2O$	474.38
" and Potassium Sulfate		
anhydrous	$AlK(SO_4)_2$	258.19
" Chloride	$AlCl_3 . 6H_2O$	241.44
" " anhydrous	$AlCl_3$	133.34
" Hydroxide	$Al(OH)_3$	77.99
" Oxide	Al_2O_3	101.94
" Phosphate	$AlPO_4$	121.95
" Sulfate	$Al_2(SO_4)_3 . 18H_2O$	666.41
" " anhydrous	$Al_2(SO_4)_3$	342.12
Amaranth (F. D. & C. Red No. 2)	$C_{20}H_{10}N_2(OH)(SO_3Na)_3$	604.48
Amethocaine Hydrochloride (see Tetracaine Hydrochloride)		
Amidopyrine (see Aminopyrine)		
Aminoacetic Acid (Glycine, Glycocoll)	H_2NCH_2COOH	75.07
p-Aminoacetophenone	$H_2NC_6H_4COCH_3$	135.16
p-Aminobenzoic Acid	$H_2NC_6H_4COOH$	137.13
3-Amino-4-hydroxyphenylarsineoxide Hydrochloride (see Oxophenarsine Hydrochloride)		

1-Amino-2-naphthol-4-sulfonic Acid	$C_{10}H_5(NH_2)(OH)(SO_3H).\frac{1}{2}H_2O$	248.25
" anhydrous	$C_{10}H_5(NH_2)(OH)(SO_3H)$	239.24
Aminopyrine (Amidopyrine)	$N(C_6H_5)N(CH_3)C(CH_3){:}C[N(CH_3)_2]CO$	231.29
Aminoquin (see Pamaquine)		
Ammonia	NH_3	17.03
Ammoniated Mercury (see Mercury, Ammoniated)		
Ammonium Acetate	CH_3COONH_4	77.08
" Alum (see Aluminum and Ammonium Sulfate)		
" Bicarbonate (Ammonium Acid Carbonate)	NH_4HCO_3	79.06
" Bromide	NH_4Br	97.96
" Carbamate	$H_2NCOONH_4$	78.07
" Carbonate, normal	$(NH_4)_2CO_3$	96.09
" " U. S. P. (approx.)	$NH_4HCO_3.H_2NCOONH_4$	157.13
" Chloride (Muriate of Ammonia)	NH_4Cl	53.50
" Citrate, dibasic	$C_3H_4OH(COOH)(COONH_4)_2$	226.19
" Hydroxide	NH_4OH	35.05
" Hypophosphite	$NH_4PH_2O_2$	83.04
" Iodide	NH_4I	144.96
" Metavanadate (Ammonium Vanadate)	NH_4VO_3	116.99
" Molybdate	$(NH_4)_6Mo_7O_{24}.4H_2O$	1235.95
" Nitrate	NH_4NO_3	80.05
" Oxalate	$(COONH_4)_2.H_2O$	142.12
" " anhydrous	$(COONH_4)_2$	124.10
" Phosphate, Dibasic (Diammonium Hydrogen Phosphate)	$(NH_4)_2HPO_4$	132.07
" Reineckate (Reinecke Salt)	$NH_4[Cr(NH_3)_2(SCN)_4].H_2O$	354.44
" Salicylate	$HOC_6H_4COONH_4$	155.15
" Sodium Phosphate (see Sodium Ammonium Phosphate)		
" Sulfocyanate (see Ammonium Thiocyanate)		
" Sulfamate	$NH_4OSO_2NH_2$	114.12
" Sulfate	$(NH_4)_2SO_4$	132.14
" Sulfide	$(NH_4)_2S$	68.14
" Thiocyanate (Ammonium Sulfocyanate, " Ammonium Sulfocyanide)	NH_4SCN	76.12
" Valerate (Ammonium Valerianate)	$C_4H_9COONH_4$	119.16
" Vanadate (see Ammonium Metavanadate)		
Amyl Alcohol, normal (1-Pentanol)	$CH_3(CH_2)_3CH_2OH$	88.15
" " tertiary (see Amylene Hydrate)		
Amyl Nitrite (Isoamyl Nitrite)	$(CH_3)_2CHCH_2CH_2ONO$	117.15
Amylene Hydrate (Amyl Alcohol, tertiary)	$CH_3CH_2C(CH_3)_2OH$	88.15
Anethole (*p*-Propenylanisole)	$CH_3OC_6H_4CH{:}CHCH_3$	148.20

Aneurine Hydrochloride (see Thiamine Hydrochloride)		
Anhydrohydroxyprogesterone	$C_{21}H_{28}O_2$	312.43
Aniline (Phenylamine)	$C_6H_5NH_2$	93.12
" Sulfate	$(C_6H_5NH_2)_2 \cdot H_2SO_4$	284.32
Antimony	**Sb**	**121.76**
Antimony Potassium Tartrate (Antimonyl Potassium Tartrate, Tartar Emetic)	$KOOC(CHOH)_2COOSbO \cdot \frac{1}{2}H_2O$	333.94
Antimony Potassium Tartrate, anhydrous	$KOOC(CHOH)_2COOSbO$	324.93
" Sodium Thioglycollate	$NaOOCCH_2SSbSCH_2COO$	324.95
" Sulfide	Sb_2S_3	339.70
Antipyrine (Phenazone)	$N(C_6H_5)N(CH_3)C(CH_3):CHCO$	188.22
Apomorphine Hydrochloride	$C_{17}H_{17}O_2N \cdot HCl \cdot \frac{1}{2}H_2O$	312.79
" " anhydrous	$C_{17}H_{17}O_2N \cdot HCl$	303.78
l-Arabinose	$C_5H_{10}O_5$	150.13
Arecoline	$CH_2C(COOCH_3):CHCH_2CH_2NCH_3$	155.19
" Hydrobromide	$CH_2C(COOCH_3):CHCH_2CH_2NCH_3 \cdot HBr$	236.12
Argon	**A**	**39.944**
Arsenic	**As**	**74.91**
Arsenic Acid	$H_3AsO_4 \cdot \frac{1}{2}H_2O$	150.94
" " anhydrous	H_3AsO_4	141.93
" Pentoxide (Arsenic Anhydride)	As_2O_5	229.82
" Triiodide (Arsenious Iodide)	AsI_3	455.67
" Trioxide (Arsenious Acid, Arsenious Anhydride, Arsenious Oxide)	As_2O_3	197.82
Arsphenamine (3,3′-Diamino-4,4′-dihydroxy-arsenobenzene Dihydrochloride)	$[AsC_6H_3(NH_2)(OH)]_2 \cdot 2HCl \cdot 2H_2O$	475.01
Ascaridole	$C_{10}H_{16}O_2$	168.23
Ascorbic Acid (Vitamin C)	$CH_2OHCHOHCHCOH:COHCOO$	176.12
Aspirin (see Acetylsalicylic Acid)		
Atropine	$C_{17}H_{23}O_3N$	289.36
" Sulfate	$(C_{17}H_{23}O_3N)_2 \cdot H_2SO_4 \cdot H_2O$	694.82
" " anhydrous	$(C_{17}H_{23}O_3N)_2 \cdot H_2SO_4$	676.81
Barbital (Barbitone, Diethylbarbituric Acid, Diethylmalonylurea)	$NHCONHCOC(C_2H_5)_2CO$	184.19
" Sodium (Soluble Barbital, Soluble Barbitone)	$NHC(ONa):NCOC(C_2H_5)_2CO$	206.18
Barium	**Ba**	**137.36**
Barium Carbonate	$BaCO_3$	197.37
" Chloride	$BaCl_2 \cdot 2H_2O$	244.31
" " anhydrous	$BaCl_2$	208.27
" Hydroxide	$Ba(OH)_2 \cdot 8H_2O$	315.50

Barium Hydroxide, anhydrous	$Ba(OH)_2$	171.38
" Nitrate	$Ba(NO_3)_2$	261.38
" Sulfate	$BaSO_4$	233.42
" Sulfide	BaS	169.42
Bayer 205 (see Suramin Sodium)		
Benzaldehyde	C_6H_5CHO	106.12
Benzene (Benzol)	C_6H_6	78.11
Benzidine (*p,p'*-Diaminodiphenyl)	$H_2NC_6H_4C_6H_4NH_2$	184.23
Benzocaine (see Ethyl *p*-Aminobenzoate)		
Benzoic Acid	C_6H_5COOH	122.12
Benzol (see Benzene)		
Benzosulfinide (see Saccharin)		
Benzoyl Chloride	C_6H_5COCl	140.57
Benzyl Alcohol (Phenylcarbinol)	$C_6H_5CH_2OH$	108.13
" Benzoate	$C_6H_5COOCH_2C_6H_5$	212.24
" Cinnamate	$C_6H_5CH{:}CHCOOCH_2C_6H_5$	238.27
Beryllium (Glucinum)	**Be**	9.02
Betaeucaine Hydrochloride (see Eucaine Hydrochloride)		
Betanaphthol	$C_{10}H_7OH$	144.16
Biebrich Scarlet Red (see Scarlet Red)		
Biotin	$C_{10}H_{16}N_2O_3S$	244.30
Bismuth	Bi	209.00
Bismuth Carbonate, Basic (see Bismuth Subcarbonate)		
" Citrate (approx.)	$C_3H_4OH(COO)_3Bi$	398.10
" Gallate, Basic (see Bismuth Subgallate)		
" Hydroxide	$Bi(OH)_3$	260.02
" Nitrate, Basic (see Bismuth Subnitrate)		
" Oxide (see Bismuth Trioxide)		
" Phosphate	$BiPO_4$	303.98
" Salicylate, Basic (see Bismuth Subsalicylate)		
" Subcarbonate (Basic Bismuth Carbonate) (approx.)	$[(BiO)_2CO_3]_2 \cdot H_2O$	1038.04
" Subgallate (Basic Bismuth Gallate, Dermatol) (approx.)	$C_6H_2(OH)_3COOBiO \cdot H_2O$	412.13
" Subnitrate (Basic Bismuth Nitrate) (approx.)	$BiONO_3 \cdot H_2O$	305.02
" Subsalicylate (Basic Bismuth Salicylate) (approx.)	$HOC_6H_4COOBiO \cdot H_2O$	380.13
" Trioxide (Bismuth Oxide)	Bi_2O_3	466.00
Boracic Acid (see Boric Acid)		
Borax (see Sodium Borate)		
Boric Acid (Boracic Acid)	H_3BO_3	61.84
Borneol	$C_{10}H_{17}OH$	154.24
Bornyl Acetate	$CH_3COOC_{10}H_{17}$	196.28
Boroglycerin (see Glyceryl Borate)		
Boron	**B**	10.82
Boron Trioxide	B_2O_3	69.64
Bromine	**Br**	79.916

Bromocresol Green	$C_{21}H_{14}Br_4O_5S$	698.05
" Purple	$C_{21}H_{16}Br_2O_5S$	540.23
Bromodiethylacetylurea (see Carbromal)		
Bromoform	$CHBr_3$	252.77
Bromophenol Blue (Tetrabromophenolsulfonphthalein)	$C_{19}H_{10}Br_4O_5S$	669.99
Bromothymol Blue (Dibromothymolsulfonphthalein)	$C_{27}H_{28}Br_2O_5S$	624.39
Brown No. 1, D. and C. (see Resorcin Brown)		
Brucine	$C_{23}H_{26}N_2O_4.4H_2O$	466.52
" anhydrous	$C_{23}H_{26}N_2O_4$	394.45
" Sulfate	$(C_{23}H_{26}N_2O_4)_2.H_2SO_4.7H_2O$	1013.10
" " anhydrous	$(C_{23}H_{26}N_2O_4)_2.H_2SO_4$	886.99
Butacaine Sulfate	$[H_2NC_6H_4COO(CH_2)_3N(C_4H_9)_2]_2.H_2SO_4$	710.95
Butter Yellow (see *p*-Dimethylaminoazobenzene)		
Butyl Alcohol, normal (1-Butanol)	$CH_3(CH_2)_2CH_2OH$	74.12
" " tertiary	$(CH_3)_3COH$	74.12
n-Butyl *p*-Aminobenzoate	$H_2NC_6H_4COO(CH_2)_3CH_3$	193.24
n-Butyric Acid	$CH_3(CH_2)_2COOH$	88.10
Cadmium	**Cd**	**112.41**
Caffeine	$C_8H_{10}N_4O_2.H_2O$	212.21
" anhydrous	$C_8H_{10}N_4O_2$	194.19
Calciferol (Viosterol, Vitamin D_2)	$C_{28}H_{43}OH$	396.63
Calcium	**Ca**	40.08
Calcium Biphosphate (Monobasic Calcium Phosphate)	$Ca(H_2PO_4)_2.H_2O$	252.09
" " anhydrous	$Ca(H_2PO_4)_2$	234.07
" Bromide	$CaBr_2.2H_2O$	235.94
" " anhydrous	$CaBr_2$	199.91
" Carbonate	$CaCO_3$	100.09
" Chloride	$CaCl_2.2H_2O$	147.03
" " anhydrous	$CaCl_2$	110.99
" Gluconate	$[CH_2OH(CHOH)_4COO]_2Ca.H_2O$	448.39
" " anhydrous	$[CH_2OH(CHOH)_4COO]_2Ca$	430.38
" Glycerophosphate	$C_3H_5(OH)_2OPO_3Ca.H_2O$	228.16
" " anhydrous	$C_3H_5(OH)_2OPO_3Ca$	210.15
" Hydroxide (Calcium Hydrate, Slaked Lime)	$Ca(OH)_2$	74.10
" Hypophosphite	$Ca(PH_2O_2)_2$	170.07
" Iodobehenate (Calcium Monoiodobehenate)	$(C_{21}H_{42}ICOO)_2Ca$	971.03
" Lactate	$(CH_3CHOHCOO)_2Ca.5H_2O$	308.30
" " anhydrous	$(CH_3CHOHCOO)_2Ca$	218.22
" Levulinate	$[CH_3CO(CH_2)_2COO]_2Ca.2H_2O$	306.32
" " anhydrous	$[CH_3CO(CH_2)_2COO]_2Ca$	270.29
" Mandelate	$(C_6H_5CHOHCOO)_2Ca$	342.35
" Monoiodobehenate (see Calcium Iodobehenate)		

Calcium Oxalate	$(COO)_2Ca$	128.10
" Oxide (Lime, Quicklime)	CaO	56.08
" Pantothenate	$[HOCH_2C(CH_3)_2CHOHCONH(CH_2)_2COO]_2Ca$	476.52
" Phosphate, Dibasic (Dicalcium Orthophosphate)	$CaHPO_4 \cdot 2H_2O$	172.20
" " Dibasic, anhydrous	$CaHPO_4$	136.17
" " Monobasic (see Calcium Biphosphate)		
" " Tribasic (Precipitated Calcium Phosphate)	$Ca_3(PO_4)_2$	310.20
" Sulfate	$CaSO_4 \cdot 2H_2O$	172.17
" " anhydrous	$CaSO_4$	136.14
Calomel (see Mercurous Chloride)		
Camphor	$C_{10}H_{16}O$	152.23
" Dinitrophenylhydrazone	$C_{16}H_{20}N_4O_4$	332.35
" Monobromated	$C_{10}H_{15}BrO$	231.14
Capryl Alcohol (2-Octanol)	$CH_3(CH_2)_5CHOHCH_3$	130.22
Carbachol (Carbamylcholine Chloride)	$[H_2NCOOCH_2CH_2N(CH_3)_3]Cl$	182.65
Carbamide (see Urea)		
Carbamylcholine Chloride (see Carbachol)		
Carbarsone	$H_2NCONHC_6H_4AsO(OH)_2$	260.07
Carbolic Acid (see Phenol)		
Carbon	**C**	**12.010**
Carbon Dioxide (Carbonic Acid Gas)	CO_2	44.01
" Disulfide	CS_2	76.13
" Monoxide	CO	28.01
" Tetrachloride	CCl_4	153.84
Carbonic Acid	H_2CO_3	62.03
" " Gas (see Carbon Dioxide)		
Carbromal (Bromodiethylacetylurea)	$(C_2H_5)_2CBrCONHCONH_2$	237.11
Carvone	$CH_3C{:}CHCH_2CH[C(CH_3){:}CH_2]CH_2CO$	150.21
Catechol	$C_6H_4(OH)_2$	110.11
Cephaeline	$C_{28}H_{38}N_2O_4$	466.60
Ceric Sulfate, anhydrous	$Ce(SO_4)_2$	332.25
Cerium	**Ce**	**140.13**
Cesium	**Cs**	**132.91**
Cetyl Alcohol	$CH_3(CH_2)_{14}CH_2OH$	242.43
Chalk (see Calcium Carbonate)		
Chloral Hydrate (Chloral)	$CCl_3CH(OH)_2$	165.42
Chloramine-T (Chloramine)	$CH_3C_6H_4SO_2NClNa \cdot 3H_2O$	281.70
Chloranil (Tetrachlorobenzoquinone)	$COCCl{:}CClCOCCl{:}CCl$	245.89
Chlorauric Acid (Gold Chloride)	$HAuCl_4 \cdot 4H_2O$	412.10
" " anhydrous	$HAuCl_4$	340.04
Chlorbutanol (see Chlorobutanol)		
Chlorine	**Cl**	**35.457**
Chloroazodin	$ClN.C(NH_2)N{:}NC(NH_2){:}NCl$	183.01
Chlorobutanol (Chlorbutanol)	$CCl_3C(CH_3)_2OH$	177.47

Chloroform	$CHCl_3$	119.39
5-Chloro-7-iodo-8-hydroxyquinoline (see Iodochlorohydroxyquinoline)		
Chloroplatinic Acid (Platinic Chloride)	$H_2PtCl_6.6H_2O$	518.08
" " anhydrous	H_2PtCl_6	409.98
Chlorothymol (Monochlorothymol)	$(CH_3)_2CHC_6H_2(OH)(CH_3)Cl$	184.66
Cholesterol (Cholesterin)	$C_{27}H_{45}OH$	386.64
Cholic Acid	$C_{23}H_{39}O_3COOH.H_2O$	426.58
" " anhydrous	$C_{23}H_{39}O_3COOH$	408.56
Choline Chloride	$[HOCH_2CH_2N(CH_3)_3]Cl$	139.64
Chromic Anhydride (see Chromium Trioxide)		
Chromium	**Cr**	**52.01**
Chromium Trioxide (Chromic Anhydride)	CrO_3	100.01
Chromotropic Acid	$(HO)_2C_{10}H_4(SO_3H)_2.2H_2O$	356.32
Chrysophanic Acid (Chrysophanol)	$C_{15}H_{10}O_4$	254.23
Cinchonidine	$C_{19}H_{22}N_2O$	294.38
" Sulfate	$(C_{19}H_{22}N_2O)_2.H_2SO_4.3H_2O$	740.89
" " anhydrous	$(C_{19}H_{22}N_2O)_2.H_2SO_4$	686.84
Cinchonine	$C_{19}H_{22}N_2O$	294.38
" Sulfate	$(C_{19}H_{22}N_2O)_2.H_2SO_4.2H_2O$	722.87
" " anhydrous	$(C_{19}H_{22}N_2O)_2.H_2SO_4$	686.84
Cinchophen (Phenylcinchoninic Acid, Phenylquinolinecarboxylic Acid)	$C_6H_5C_9H_5NCOOH$	249.26
Cineol (see Eucalyptol)		
Cinnamaldehyde (Cinnamic Aldehyde)	$C_6H_5CH:CHCHO$	132.15
Cinnamein (see Benzyl Cinnamate)		
Cinnamic Acid	$C_6H_5CH:CHCOOH$	148.15
" Aldehyde (see Cinnamaldehyde)		
Citric Acid	$HOOCCH_2C(OH)(COOH)CH_2COOH.H_2O$	210.14
" " anhydrous	$HOOCCH_2C(OH)(COOH)CH_2COOH$	192.12
Cobalt	**Co**	**58.94**
Cobaltous Acetate (Cobalt Acetate)	$(CH_3COO)_2Co.4H_2O$	249.09
" " anhydrous	$(CH_3COO)_2Co$	177.03
" Chloride (Cobalt Chloride)	$CoCl_2.6H_2O$	237.95
" " anhydrous	$CoCl_2$	129.85
" Nitrate (Cobalt Nitrate)	$Co(NO_3)_2.6H_2O$	291.05
" " anhydrous	$Co(NO_3)_2$	182.96
" Sulfate, "Dried"	$CoSO_4.2H_2O$	191.03
" " anhydrous	$CoSO_4$	155.00
Cocaine	$C_{17}H_{21}NO_4$	303.35
" Hydrochloride	$C_{17}H_{21}NO_4.HCl$	339.81
Cocculin (see Picrotoxin)		
Codeine (Methylmorphine)	$C_{18}H_{21}O_3N.H_2O$	317.37
" anhydrous	$C_{18}H_{21}O_3N$	299.36
Codeine Phosphate	$C_{18}H_{21}O_3N.H_3PO_4.1\frac{1}{2}H_2O$	424.38
" " anhydrous	$C_{18}H_{21}O_3N.H_3PO_4$	397.36
" Sulfate	$(C_{18}H_{21}O_3N)_2.H_2SO_4.5H_2O$	786.87
" " anhydrous	$(C_{18}H_{21}O_3N)_2.H_2SO_4$	696.79
Colchicine	$C_{22}H_{25}NO_6$	399.43

Columbium	Cb	92.91
Congo Red	$[C_6H_4N{:}NC_{10}H_5(NH_2)(SO_3Na)]_2$	696.66
Copper	**Cu**	63.57
Copper Compounds (see under Cupric and Cuprous)		
Corrosive Sublimate (see Mercuric Chloride)		
Cotarnine	$C_{12}H_{15}NO_4$	237.25
" Chloride (Cotarnine Hydrochloride)	$C_{12}H_{14}ClO_3N \cdot 2H_2O$	291.73
" " anhydrous	$C_{12}H_{14}ClO_3N$	255.70
Coumarin	$OC_6H_4CH{:}CHCO$	146.14
Cream of Tartar (see Potassium Bitartrate)		
Creatinine	$CH_3NC({:}NH)NHCOCH_2$	113.12
Cresol	$CH_3C_6H_4OH$	108.13
Cupric Acetate	$(CH_3COO)_2Cu \cdot H_2O$	199.67
" " anhydrous	$(CH_3COO)_2Cu$	181.66
" Citrate	$C_6H_4O_7Cu_2 \cdot 2\frac{1}{2}H_2O$	360.27
" " anhydrous	$C_6H_4O_7Cu_2$	315.23
" Oxide	CuO	79.57
" Sulfate	$CuSO_4 \cdot 5H_2O$	249.71
" anhydrous	$CuSO_4$	159.63
Cuprous Oxide	Cu_2O	143.14
Cyclopropane (Trimethylene)	$CH_2CH_2CH_2$	42.08
l-Cystine	$[SCH_2CH(NH_2)COOH]_2$	240.29
7-Dehydrocholesterol	$C_{27}H_{43}OH$	384.62
" Activated (Vitamin D_3)	$C_{27}H_{43}OH$	384.62
Desoxycorticosterone Acetate	$C_{23}H_{32}O_4$	372.49
Dextrose (*d*-Glucose)	$C_6H_{12}O_6 \cdot H_2O$	198.17
" anhydrous	$C_6H_{12}O_6$	180.16
2,8-Diaminoacridine	$C_{13}H_{11}N_3$	209.24
" Hydrochloride	$C_{13}H_{11}N_3 \cdot HCl$	245.71
2,8-Diamino-10-methylacridinium Chloride	$C_{14}H_{14}ClN_3$	259.73
2,8-Diamino-10-methylacridinium Chloride Hydrochloride	$C_{14}H_{14}ClN_3 \cdot HCl$	296.20
3,3′-Diamino-4,4′-dihydroxyarsenobenzene Dihydrochloride (see Arsphenamine)		
p,p′-Diaminodiphenyl (see Benzidine)		
Diammonium Hydrogen Phosphate (see Ammonium Phosphate, Dibasic)		
Diazobenzenesulfonic Acid	$N{:}NC_6H_4SO_2O$	184.17
Dibromothymolsulfonphthalein (see Bromothymol Blue)		
Dicalcium Orthophosphate (see Calcium Phosphate, Dibasic)		

Dichloramine-T (Dichloramine, *p*-Toluenesulfondichloramide)	$CH_3C_6H_4SO_2NCl_2$	240.11
Dichlorofluorescein	$C_{20}H_{10}Cl_2O_5$	401.19
Dichloromethane (see Methylene Chloride)		
Dichlorophenarsine Hydrochloride	$(NH_2)(OH)C_6H_3AsCl_2 \cdot HCl$	290.41
2,6-Dichlorophenol-indophenol Sodium	$O:C_6H_2Cl_2.NC_6H_4ONa \cdot 2H_2O$	308.11
2,6-Dichlorophenol-indophenol Sodium, anhydrous	$O:C_6H_2Cl_2:NC_6H_4ONa$	290.09
Diethanolamine	$(HOCH_2CH_2)_2NH$	105.14
Diethyl Ether (see Ether)		
Diethylbarbituric Acid (see Barbital)		
Diethylene Dioxide (see Dioxane)		
Diethylmalonylurea (see Barbital)		
Diethylstilbestrol (Stilbestrol)	$HOC_6H_4(C_2H_5)C:C(C_2H_5)C_6H_4OH$	268.34
" Diacetate (Stilbestrol Diacetate)	$CH_3COOC_6H_4(C_2H_5)C:C(C_2H_5)C_6H_4OCOCH_3$	352.41
Digitoxin	$C_{41}H_{64}O_{13}$	764.92
Digoxin	$C_{41}H_{64}O_{14}$	780.92
Dihydromorphinone	$C_{17}H_{19}O_3N$	285.33
" Hydrochloride	$C_{17}H_{19}O_3N \cdot HCl$	321.80
Dihydrotheelin (see Estradiol)		
o-Dihydroxybenzene (see Catechol)		
3,5-Dihydroxytoluene (see Orcinol)		
Diiodofluorescein	$C_{20}H_{10}I_2O_5$	584.12
3,5-Diiodo-4-pyridone-N-acetic Acid	$CH \cdot CICOCI:CHNCH_2COOH$	404.96
Dimethyl Ketone (see Acetone)		
Dimethylamine	$(CH_3)_2NH$	45.08
p-Dimethylaminoazobenzene	$(CH_3)_2NC_6H_4N:NC_6H_5$	225.28
p-Dimethylaminobenzaldehyde	$(CH_3)_2NC_6H_4CHO$	149.19
Dimethylglyoxime	$HON.C(CH_3)C(CH_3).NOH$	116.12
2,4-Dinitrochlorobenzene	$C_6H_3Cl(NO_2)_2$	202.56
2,4-Dinitrophenylhydrazine	$(NO_2)_2C_6H_3NHNH_2$	198.14
3,5-Dinitrosalicylic Acid	$C_6H_2(NO_2)_2(OH)COOH$	228.12
Dioctyl Sodium Sulfosuccinate	$C_8H_{17}OOCCH_2CH(SO_3Na)COOC_8H_{17}$	444.55
Dioxane (Diethylene Dioxide)	$OCH_2CH_2OCH_2CH_2$	88.10
Diphenylamine	$(C_6H_5)_2NH$	169.22
Diphenylhydantoin (Phenytoin)	$(C_6H_5)_2CNHCONHCO$	252.26
" Sodium (Soluble Phenytoin)	$(C_6H_5)_2CNHC(ONa):NCO$	274.25
Diphenylthiocarbazone (see Dithizone)		
Dipotassium Phosphate (see Potassium Phosphate, Dibasic)		
Disodium Phosphate (see Sodium Phosphate)		
" 3,3′-Diamino-4,4′-dihydroxy-arsenobenzene-*N*, *N*′-dimethylenesulfonate	$[AsC_6H_3(NHCH_2SO_3Na)(OH)]_2$	598.20

Dithizone (Diphenylthiocarbazone)	$C_6H_5N{:}NCSNHNHC_6H_5$	256.32
Dithymol Diiodide	$[C_6H_2(CH_3)(OI)CH(CH_3)_2]_2$	550.23
Divinyl Oxide (See Vinyl Ether)		
Dulcitol (Dulcite)	$C_6H_8(OH)_6$	182.17
Dysprosium	Dy	**162.46**
Ecgonine	$C_9H_{15}O_3N.H_2O$	185.22
" anhydrous	$C_9H_{15}O_3N$	167.20
Emetine	$C_{29}H_{40}N_2O_4$	480.63
" Hydrochloride	$C_{29}H_{40}N_2O_4.2HCl$	553.56
Eosin Y (Sodium Tetrabromofluorescein, Soluble Tetrabromofluorescein)	$C_{20}H_6Br_4O_5Na_2$	691.91
Ephedrine, anhydrous	$C_6H_5CH(OH)CH(NHCH_3)CH_3$	165.23
" hemihydrate	$C_6H_5CH(OH)CH(NHCH_3)CH_3.\frac{1}{2}H_2O$	174.24
" Hydrochloride	$C_6H_5CH(OH)CH(NHCH_3)CH_3.HCl$	201.69
" Sulfate	$[C_6H_5CH(OH)CH(NHCH_3)CH_3]_2.H_2SO_4$	428.53
Epinephrine, anhydrous	$(HO)_2C_6H_3CH(OH)CH_2NHCH_3$	183.20
" hemihydrate	$(HO)_2C_6H_3CH(OH)CH_2NHCH_3.\frac{1}{2}H_2O$	192.21
" Hydrochloride	$(HO)_2C_6H_3CH(OH)CH_2NHCH_3.HCl$	219.67
Epsom Salt (see Magnesium Sulfate)		
Erbium	Er	**167.2**
Ergonovine	$C_{19}H_{23}N_3O_2$	325.40
" Maleate	$C_{19}H_{23}N_3O_2.H_2C_4H_2O_4$	441.47
Ergosterol	$C_{28}H_{43}OH$	396.63
" Activated (see Calciferol)		
Ergotamine	$C_{33}H_{35}N_5O_5$	581.65
" Tartrate	$(C_{33}H_{35}N_5O_5)_2.H_2C_4H_4O_6$	1313.39
Ergotoxine	$C_{35}H_{41}N_5O_6$	627.72
" Ethanesulfonate	$C_{35}H_{41}N_5O_6.C_2H_5SO_3H$	737.85
Erythrityl Tetranitrate (Erythrol Tetranitrate, Tetranitrol)	$CH_2NO_3(CHNO_3)_2CH_2NO_3$	302.12
Eserine Salicylate (see Physostigmine Salicylate)		
Estradiol (Dihydrotheelin, Œstradiol)	$C_{18}H_{24}O_2$	272.37
" Benzoate (Œstradiol Benzoate)	$C_6H_5COOC_{18}H_{23}O$	376.47
Estrone (Œstrone, Theelin)	$C_{18}H_{22}O_2$	270.36
Ethanol (see Alcohol)		
Ethanolamine (Monoethanolamine)	$HOCH_2CH_2NH_2$	61.08
Ether (Diethyl Ether, Ethyl Ether, Ethyl Oxide)	$(C_2H_5)_2O$	74.12
Ethyl Acetate (Acetic Ether)	$CH_3COOC_2H_5$	88.10
" **Alcohol** (see Alcohol)		
" ***p*-Aminobenzoate** (Benzocaine)	$H_2NC_6H_4COOC_2H_5$	165.19
" **Carbamate** (Urethane)	$H_2NCOOC_2H_5$	89.09
" **Chloride**	C_2H_5Cl	64.52
" **Cyanoacetate**	$NCCH_2COOC_2H_5$	113.11
" **Ether** (see Ether)		
" **Nitrite** (Nitrous Ether)	C_2H_5ONO	75.07
" **Oxide** (see Ether)		

Ethylene	$CH_2:CH_2$	28.05
Ethylenediamine	$H_2NCH_2CH_2NH_2$	60.10
Ethylhydrocupreine	$C_{21}H_{28}N_2O_2$	340.45
" Hydrochloride	$C_{21}H_{28}N_2O_2 \cdot HCl$	376.92
Ethylmorphine Hydrochloride	$C_{19}H_{23}O_3N \cdot HCl \cdot 2H_2O$	385.88
" " anhydrous	$C_{19}H_{23}O_3N \cdot HCl$	349.85
Eucaine Hydrochloride (Betaeucaine Hydrochloride)	$C_{15}H_{21}O_2N \cdot HCl$	283.79
Eucalyptol (Cineol)	$C_{10}H_{18}O$	154.24
Eucatropine	$C_{17}H_{25}O_3N$	291.38
" Hydrochloride	$C_{17}H_{25}O_3N \cdot HCl$	327.84
Eugenol	$HOC_6H_3(OCH_3)(CH_2CH:CH_2)$	164.20
Euquinine (see Quinine Ethylcarbonate)		
Europium	Eu	152.0
Ferric Ammonium Sulfate	$FeNH_4(SO_4)_2 \cdot 12H_2O$	482.20
" " " anhydrous	$FeNH_4(SO_4)_2$	266.01
" Cacodylate (Iron Cacodylate)	$[(CH_3)_2AsO_2]_3Fe$	466.78
" Chloride (Iron Perchloride)	$FeCl_3 \cdot 6H_2O$	270.32
" " anhydrous	$FeCl_3$	162.22
" Citrate, anhydrous	$C_3H_4OH(COO)_3Fe$	244.95
" Glycerophosphate	$[C_3H_5(OH)_2OPO_3]_3Fe_2$	621.90
" Hydroxide	$Fe(OH)_3$	106.87
" Hypophosphite	$Fe(PH_2O_2)_3$	250.84
" Oxide	Fe_2O_3	159.70
" Sulfate (Iron Tersulfate)	$Fe_2(SO_4)_3$	399.88
Ferrous Ammonium Sulfate	$Fe(NH_4)_2(SO_4)_2 \cdot 6H_2O$	392.15
" " " anhydrous	$Fe(NH_4)_2(SO_4)_2$	284.05
" Carbonate	$FeCO_3$	115.86
" Gluconate	$[CH_2OH(CHOH)_4COO]_2Fe \cdot 2H_2O$	482.18
" " anhydrous	$[CH_2OH(CHOH)_4COO]_2Fe$	446.15
" Iodide	FeI_2	309.69
" Sulfate (Iron Sulfate)	$FeSO_4 \cdot 7H_2O$	278.02
" " anhydrous	$FeSO_4$	151.91
" Sulfide	FeS	87.91
Ferrum (see Iron)		
Fluorescein (Resorcinolphthalein)	$C_{20}H_{12}O_5$	332.30
" Sodium (Resorcinolphthalein Sodium, Soluble Fluorescein)	$C_{20}H_{10}O_5Na_2$	376.27
Fluorine	F	19.00
Formaldehyde	HCHO	30.03
Formic Acid	HCOOH	46.03
Furfural	OCH:CHCH:CCHO	96.08
G-Strophanthin (see Ouabain)		
Gadolinium	Gd	156.9
***d*-Galactose**	$C_6H_{12}O_6$	180.16
Gallic Acid	$(HO)_3C_6H_2COOH \cdot H_2O$	188.13

Gallic Acid, anhydrous	$(HO)_3C_6H_2COOH$	170.12
Gallium	Ga	69.72
Germanium	Ge	72.60
Glauber's Salt (see Sodium Sulfate)		
Glucinum (see Beryllium)		
d-Glucose (see Dextrose)		
Gluside (see Saccharin)		
Glycerin (Glycerol)	$C_3H_5(OH)_3$	92.09
Glyceryl Borate (Boroglycerin)	$C_3H_5BO_3$	99.89
" Monostearate (Monostearin)	$CH_3(CH_2)_{16}COOC_3H_5(OH)_2$	358.55
" Triacetate (Triacetin)	$(CH_3COO)_3C_3H_5$	218.20
" Trinitrate (Nitroglycerin, Trinitrin)	$C_3H_5(NO_3)_3$	227.09
Glycine (Glycocoll) (see Aminoacetic Acid)		
Gold	Au	197.2
Gold and Sodium Thiosulfate	$Na_3Au(S_2O_3)_2.2H_2O$	526.47
" " " " anhydrous	$Na_3Au(S_2O_3)_2$	490.44
" Chloride (see Chlorauric Acid)		
Guaiacol	$HOC_6H_4OCH_3$	124.13
Guanine Hydrochloride	$C_5H_5N_5O.HCl.H_2O$	205.61
" " anhydrous	$C_5H_5N_5O.HCl$	187.60
Hafnium	Hf	178.6
Halazone	$HOOCC_6H_4SO_2NCl_2$	270.09
Helianthin (see Methyl Orange)		
Helium	He	4.003
Hematein	$C_{16}H_{12}O_6$	300.26
Hematoxylin (Hydroxybrasilin)	$C_{16}H_{14}O_6.3H_2O$	356.32
" anhydrous	$C_{16}H_{14}O_6$	302.27
Hexamethylenamine (Hexamethylenetetramine) (see Methenamine)		
Hexamethylpararosaniline Chloride	$[(CH_3)_2NC_6H_4]_3CCl$	407.97
Hexylresorcinol	$CH_3(CH_2)_5C_6H_3(OH)_2$	194.26
Histamine Phosphate (Histamine Acid Phosphate)	$N{:}CHNHCH{:}CCH_2CH_2NH_2.2H_3PO_4$	307.15
Histidine Monohydrochloride	$N{:}CHNHCH{:}CCH_2CH(NH_2)$-$COOH.HCl.H_2O$	209.64
" " anhydrous	$N{:}CHNHCH{:}CCH_2CH(NH_2)COOH.HCl$	191.62
Holmium	Ho	164.94
Homatropine	$C_{16}H_{21}O_3N$	275.34
" Hydrobromide	$C_{16}H_{21}O_3N.HBr$	356.26
" Methylbromide	$C_{16}H_{21}O_3N.CH_3Br$	370.29
Hydrastine	$C_{21}H_{21}NO_6$	383.39
Hydrastine Hydrochloride	$C_{21}H_{21}NO_6.HCl$	419.85
Hydrazine Sulfate	$H_2NNH_2.H_2SO_4$	130.12
Hydriodic Acid (Hydrogen Iodide)	HI	127.93
Hydrobromic Acid (Hydrogen Bromide)	HBr	80.92

Hydrochloric Acid (Hydrogen Chloride)	HCl	36.47
Hydrocyanic Acid (Hydrogen Cyanide)	HCN	27.03
Hydrofluoric Acid (Hydrogen Fluoride)	HF	20.01
Hydrogen	**H**	**1.0080**
Hydrogen Bromide (see Hydrobromic Acid)		
" Chloride (see Hydrochloric Acid)		
" Cyanide (see Hydrocyanic Acid)		
" Dioxide (see Hydrogen Peroxide)		
" Fluoride (see Hydrofluoric Acid)		
" Iodide (see Hydriodic Acid)		
" Peroxide (Hydrogen Dioxide)	H_2O_2	34.02
" Sulfide	H_2S	34.08
o-Hydroxybenzaldehyde (see Salicylaldehyde)		
o-Hydroxybenzoic Acid (see Salicylic Acid)		
Hydroxybrasilin (see Hematoxylin)		
Hydroxylamine	$HONH_2$	33.03
" Hydrochloride	$HONH_2 \cdot HCl$	69.50
8-Hydroxyquinoline (Oxine)	HOC_9H_6N	145.15
Hyoscine (see Scopolamine)		
Hyoscyamine	$C_{17}H_{23}O_3N$	289.36
Hypophosphorous Acid	HPH_2O_2	66.00
Indigo Carmine (see Sodium Indigotindisulfonate)		
Indium	**In**	**114.76**
Iodeosin (Tetraiodofluorescein)	$C_{20}H_8I_4O_5$	835.94
Iodic Acid	HIO_3	175.93
Iodic Anhydride (see Iodine Pentoxide)		
Iodine	**I**	**126.92**
Iodine Monobromide	IBr	206.84
" Pentoxide (Iodic Anhydride)	I_2O_5	333.84
Iodochlorohydroxyquinoline (5-Chloro-7-iodo-8-hydroxyquinoline)	$C_9H_4NClIOH$	305.52
Iodoform (Triiodomethane)	CHI_3	393.78
Iodophthalein Sodium (Soluble Iodophthalein, Tetraiodophenolphthalein Sodium, Tetraiodophthalein Sodium, Tetiothalein Sodium)	$C_{20}H_8I_4O_4Na_2 \cdot 3H_2O$	919.99
Iodophthalein Sodium, anhydrous	$C_{20}H_8I_4O_4Na_2$	865.94
Iodopyrin	$C_5H_2I_2ONCH_2COONH_2(CH_2CH_2OH)_2$	510.09
Iridium	**Ir**	**193.1**
Iron	**Fe**	**55.85**
Iron Compounds (see under Ferric and Ferrous)		
Isatin	$C_6H_4COC(OH){\cdot}N$	147.13
Isoamyl Alcohol	$(CH_3)_2CHCH_2CH_2OH$	88.15
" Nitrite (see Amyl Nitrite)		
Isobutyl Alcohol (Isopropylcarbinol)	$(CH_3)_2CHCH_2OH$	74.12
Isodulcitol (see *l*-Rhamnose)		

Isopropyl Alcohol (Isopropanol, 2-Propanol)	$CH_3CH(OH)CH_3$	60.09
Isopropylcarbinol (see Isobutyl Alcohol)		
Krypton	**Kr**	**83.7**
Lactic Acid	$CH_3CHOHCOOH$	90.08
Lactoflavin (see Riboflavin)		
Lactose (Milk Sugar)	$C_{12}H_{22}O_{11}.H_2O$	360.31
" anhydrous	$C_{12}H_{22}O_{11}$	342.30
Lanatoside C	$C_{49}H_{76}O_{20}$	985.10
Lanthanum	**La**	**138.92**
Lead	**Pb**	**207.21**
Lead Acetate (Sugar of Lead)	$(CH_3COO)_2Pb.3H_2O$	379.35
" " anhydrous	$(CH_3COO)_2Pb$	325.30
" " Basic (see Lead Subacetate)		
" Carbonate (Basic Lead Carbonate) (approx.)	$(PbCO_3)_2.Pb(OH)_2$	775.67
" Dioxide (Lead Peroxide)	PbO_2	239.21
" Monoxide (Lead Oxide, Litharge)	PbO	223.21
" Nitrate	$Pb(NO_3)_2$	331.23
" Oxide (see Lead Monoxide)		
" Peroxide (see Lead Dioxide)		
" Subacetate (Basic Lead Acetate) (approx.)	$(CH_3COO)_2Pb.2Pb(OH)_2$	807.75
" Sulfate	$PbSO_4$	303.27
" Sulfide	PbS	239.27
Lime (see Calcium Oxide)		
" Slaked (see Calcium Hydroxide)		
Linalyl Acetate	$CH_3COOC_{10}H_{17}$	196.28
Litharge (see Lead Monoxide)		
Lithium	**Li**	**6.940**
Lithium Benzoate	C_6H_5COOLi	128.05
" Bromide	$LiBr$	86.86
" Carbonate	Li_2CO_3	73.89
" Citrate	$C_3H_4OH(COOLi)_3.4H_2O$	281.98
" " anhydrous	$C_3H_4OH(COOLi)_3$	209.92
" Oxalate	$(COOLi)_2$	101.90
" Salicylate	HOC_6H_4COOLi	144.05
Lutecium	**Lu**	**174.99**
Magnesia (see Magnesium Oxide)		
Magnesium	**Mg**	**24.32**
Magnesium Carbonate, basic (approx.)	$(MgCO_3)_4.Mg(OH)_2.5H_2O$	485.74
Magnesium Chloride	$MgCl_2.6H_2O$	203.33
" " anhydrous	$MgCl_2$	95.23
" Hydroxide	$Mg(OH)_2$	58.34
" Oxide (Magnesia)	MgO	40.32

Magnesium Oxyquinolate	$(C_9H_6NO)_2Mg$	312.61
" Phosphate, Tribasic	$Mg_3(PO_4)_2.5H_2O$	353.00
" " " anhydrous	$Mg_3(PO_4)_2$	262.92
" Pyrophosphate	$Mg_2P_2O_7$	222.60
" Sulfate (Epsom Salt)	$MgSO_4.7H_2O$	246.49
" " anhydrous	$MgSO_4$	120.38
" Trisilicate, anhydrous	$Mg_2Si_3O_8$	260.82
Malic Acid	$HOOCCH_2CHOHCOOH$	134.09
Maltose	$C_{12}H_{22}O_{11}.H_2O$	360.31
" anhydrous	$C_{12}H_{22}O_{11}$	342.30
Mandelic Acid (Racemic Mandelic Acid)	$C_6H_5CHOHCOOH$	152.14
Manganese	Mn	54.93
Manganese Citrate	$[C_3H_4OH(COO)_3]_2Mn_3$	542.99
" Dioxide	MnO_2	86.93
" Glycerophosphate	$C_3H_5(OH)_2OPO_3Mn$	225.00
" Hypophosphite	$Mn(PH_2O_2)_2.H_2O$	202.94
" " anhydrous	$Mn(PH_2O_2)_2$	184.92
" Pyrophosphate	$Mn_2P_2O_7$	283.82
" Sulfate, pentahydrate	$MnSO_4.5H_2O$	241.07
" " tetrahydrate	$MnSO_4.4H_2O$	223.05
" " anhydrous	$MnSO_4$	150.99
Manganous-Manganic Oxide	Mn_3O_4	228.79
d-Mannitol (Mannite)	$C_6H_8(OH)_6$	182.17
Menadione (Menaphthene, Menaphthone, 2-Methyl-1,4-naphthoquinone)	$C_6H_4COC(CH_3):CHCO$	172.17
" Sodium Bisulfite (Menadione Bisulfite)	$C_{11}H_8O_2.NaHSO_3.3H_2O$	330.29
" " " anhydrous	$C_{11}H_8O_2.NaHSO_3$	276.24
Menthol	$(CH_3)_2CHCHCHOHCH_2CH(CH_3)CH_2CH_2$	156.26
Menthyl Acetate	$CH_3COOC_{10}H_{19}$	198.30
Mepacrine (see Quinacrine)		
Merbromin	$C_{20}H_8Br_2O_6HgNa_2$	750.70
Mercuric Bromide	$HgBr_2$	360.44
" Chloride (Corrosive Mercuric Chloride, Corrosive Sublimate, Mercury Bichloride)	$HgCl_2$	271.52
Mercuric Cyanide	$Hg(CN)_2$	252.65
" Iodide (Red Mercuric Iodide)	HgI_2	454.45
" Nitrate	$Hg(NO_3)_2.H_2O$	342.64
" " anhydrous	$Hg(NO_3)_2$	324.63
" Oxide (Yellow Mercuric Oxide, Yellow Precipitate, Red Mercuric Oxide, Red Precipitate)	HgO	216.61
Mercuric Potassium Iodide	K_2HgI_4	786.48

Mercuric Salicylate (approx.)	$C_7H_4O_3Hg$	336.71
" Succinimide	$(COCH_2CH_2CON)_2Hg$	396.77
" Sulfate	$HgSO_4$	296.67
" Sulfide	HgS	232.67
Mercurous Chloride (Calomel, Mercury Subchloride, Mild Mercurous Chloride)	$HgCl$	236.07
Mercurous Iodide (Yellow Mercurous Iodide)	HgI	327.53
" Nitrate	$HgNO_3.H_2O$	280.63
" " anhydrous	$HgNO_3$	262.62
Mercury (Quicksilver)	Hg	200.61
Mercury, Ammoniated (White Precipitate)	$HgNH_2Cl$	252.09
" Bichloride (see Mercuric Chloride)		
" Compounds (see under Mercuric and Mercurous)		
" Subchloride (see Mercurous Chloride)		
Mersalyl	$NaOOCCH_2OC_6H_4CONHCH_2CH(OCH_3)CH_2HgOH$	505.87
Metaphenylenediamine Hydrochloride (see *m*-Phenylenediamine Dihydrochloride)		
Metaphosphoric Acid	HPO_3	79.99
Methacholine Chloride (Acetyl-β-methylcholine Chloride)	$[CH_3COOCH(CH_3)CH_2N(CH_3)_3]Cl$	195.69
Methanol (see Methyl Alcohol)		
Methenamine (Hexamethylenamine, Hexamethylenetetramine)	$C_6H_{12}N_4$	140.19
Methyl Alcohol (Methanol)	CH_3OH	32.04
" Chloride	CH_3Cl	50.48
" *p*-Hydroxybenzoate (see Methylben)		
" Orange (Helianthin, Tropæolin D)	$(CH_3)_2NC_6H_4N:NC_6H_4SO_3Na$	327.33
" Red	$(CH_3)_2NC_6H_4N:NC_6H_4COOH$	269.29
" Salicylate	$HOC_6H_4COOCH_3$	152.14
" Yellow (see *p*-Dimethylaminoazobenzene)		
Methylparaben (Methyl *p*-Hydroxybenzoate)	$HOC_6H_4COOCH_3$	152.14
Methylene Blue (Methylthionine Chloride)	$C_{16}H_{18}ClN_3S.3H_2O$	373.89
" " anhydrous	$C_{16}H_{18}ClN_3S$	319.84
" Chloride (Dichloromethane)	CH_2Cl_2	85.17
Methylmorphine (see Codeine)		
2-Methyl-1,4-naphthoquinone (see Menadione)		
Methyltestosterone	$C_{20}H_{30}O_2$	302.44
Methylthionine Chloride (see Methylene Blue)		
Methylthionine Perchlorate	$C_{16}H_{18}ClN_3O_4S$	383.84
Microcosmic Salt (see Sodium Ammonium Phosphate)		
Milk Sugar (see Lactose)		

Molybdenum	Mo	**95.95**
Molybdenum Trioxide (Molybdic Anhydride)	MoO_3	143 95
Molybdic Acid	H_2MoO_4	161 97
Monochlorothymol (see Chlorothymol)		
Monoethanolamine (see Ethanolamine)		
Monopotassium Phosphate (see Potassium Phosphate, Monobasic)		
Monosodium Orthophosphate (see Sodium Biphosphate)		
Monostearin (see Glyceryl Monostearate)		
Morphine	$C_{17}H_{19}O_3N\ H_2O$	303 35
“ anhydrous	$C_{17}H_{19}O_3N$	285 33
“ Hydrochloride	$C_{17}H_{19}O_3N\ HCl\ 3H_2O$	375 84
“ “ anhydrous	$C_{17}H_{19}O_3N\ HCl$	321 80
“ Sulfate	$(C_{17}H_{19}O_3N)_2\ H_2SO_4\ 5H_2O$	758 82
“ “ anhydrous	$(C_{17}H_{19}O_3N)_2\ H_2SO_4$	668 74
“ Tartrate	$(C_{17}H_{19}O_3N)_2\ H_2C_4H_4O_6\ 3H_2O$	774 80
“ “ anhydrous	$(C_{17}H_{19}O_3N)_2\ H_2C_4H_4O_6$	720 75
Mustard Oil (see Allyl Isothiocyanate)		
Naphthalene	$C_{10}H_8$	128 16
β-Naphthol (see Betanaphthol)		
β-Naphthylamine Acetate	$C_{10}H_7NH_2\ HC_2H_3O_2$	203 23
α-Naphthylamine Hydrochloride	$C_{10}H_7NH_2\ HCl$	179.65
N-(1-Naphthyl)ethylenediamine Dihydrochloride	$C_{10}H_7NHCH_2CH_2NH_2\ 2HCl$	259 18
Naphuride (see Suramin Sodium)		
Neocinchophen	$(CH_3)(C_6H_5)C_9H_4NCOOC_2H_5$	291 33
Neodymium	Nd	**144.27**
Neon	Ne	**20.183**
Neostigmine Bromide	$(CH_3)_2NCOOC_6H_4N(CH_3)_3Br$	303 20
“ Methylsulfate	$(CH_3)_2NCOOC_6H_4N(CH_3)_3SO_4CH_3$	334 38
Niacin (see Nicotinic Acid)		
Niacinamide (see Nicotinamide)		
Nickel	Ni	**58.69**
Nicotinamide (Niacinamide, Nicotinic Acid Amide)	CH CHCH NCH CCONH$_2$	122 12
Nicotinic Acid (Niacin)	CH CHCH NCH CCOOH	123.11
Ninhydrin (see Triketohydrindene Hydrate)		
Nitric Acid	HNO_3	63 02
“ Oxide	NO	30 01
Nitrobenzene	$C_6H_5NO_2$	123 11
Nitrogen	N	**14.008**
Nitrogen Monoxide (see Nitrous Oxide)		
Nitroglycerin (see Glyceryl Trinitrate)		
Nitromersol	$(NO_2)(OHg)C_6H_2CH_3$.	351.73
Nitrous Ether (see Ethyl Nitrite)		

Nitrous Oxide (Nitrogen Monoxide)	N_2O	44.02
2-Octanol (see Capryl Alcohol)		
Œstradiol (see Estradiol)		
" Benzoate (see Estradiol Benzoate)		
Œstrone (see Estrone)		
Oleic Acid	$CH_3(CH_2)_7CH:CH(CH_2)_7COOH$	282.45
Oleyl Alcohol	$CH_3(CH_2)_7CH:CH(CH_2)_7CH_2OH$	268.47
Orange G	$C_6H_5N:NC_{10}H_4(OH)(SO_3Na)_2$	452.37
Orcinol (3,5-Dihydroxytoluene)	$CH_3C_6H_3(OH)_2$	124.13
Orthohydroxybenzoic Acid (see Salicylic Acid)		
Orthophenanthroline (see *o*-Phenanthroline)		
Osmic Acid (Osmium Tetroxide)	OsO_4	254.2
Osmium	Os	**190.2**
Ouabain (G-Strophanthin)	$C_{29}H_{44}O_{12}\ 8H_2O$	728.77
" anhydrous	$C_{29}H_{44}O_{12}$	584.64
Oxalic Acid	$(COOH)_2\ 2H_2O$	126.07
" " anhydrous	$(COOH)_2$	90.04
Oxine (see 8-Hydroxyquinoline)		
Oxophenarsine Hydrochloride (3-Amino-4-hydroxyphenylarsineoxide Hydrochloride)	$(NH_2)(OH)C_6H_3AsO\ HCl$	235.49
Oxygen	**O**	**16.00**
Oxygen	O_2	32.00
Palladium	**Pd**	**106.7**
Palladous Chloride	$PdCl_2$	177.61
Palmitic Acid	$CH_3(CH_2)_{14}COOH$	256.42
Pamaquine (Aminoquin)	$C_{19}H_{29}N_3O$	315.45
" Naphthoate (Aminoquin Naphthoate)	$C_{42}H_{45}N_3O_7$	703.80
Papaverine Hydrochloride	$C_{20}H_{21}NO_4\ HCl$	375.84
Paraformaldehyde	$(HCHO)_3$	90.08
Paraldehyde (Paracetaldehyde)	$CH_3CHOCH(CH_3)OCH(CH_3)O$	132.16
1-Pentanol (see Amyl Alcohol, normal)		
Pentamethylpararosaniline Chloride	$[(CH_3)_2NC_6H_4]_2[CH_3NHC_6H_4]CCl$	393.95
Pentobarbital	$NHCONHCOC[CH(CH_3)C_3H_7][C_2H_5]CO$	226.27
" Sodium (Soluble Pentobarbital)	$NHC(ONa):NCOC[CH(CH_3)C_3H_7][C_2H_5]CO$	248.26
Perchloric Acid	$HClO_4$	100.47
Perchloroethylene (see Tetrachloroethylene)		
Phenacaine	$C_2H_5OC_6H_4N:C(CH_3)NHC_6H_4OC_2H_5$	298.37
" Hydrochloride	$C_2H_5OC_6H_4N:C(CH_3)NHC_6H_4OC_2H_5.HCl.H_2O$	352.85
" " anhydrous	$C_2H_5OC_6H_4N:C(CH_3)NHC_6H_4OC_2H_5.HCl$	334.84

Phenacetin (see Acetophenetidin)		
o-Phenanthroline	$C_{12}H_8N_2.H_2O$	198.22
Phenazone (see Antipyrine)		
Phenobarbital (Phenobarbitone, Phenylethylmalonylurea)	$NHCONHCOC(C_6H_5)(C_2H_5)CO$	232.23
Sodium (Soluble Phenobarbital, Soluble Phenobarbitone)	$NHC(ONa){:}NCOC(C_6H_5)(C_2H_5)CO$	254.22
Phenol (Carbolic Acid)	C_6H_5OH	94.11
" Red (see Phenolsulfonphthalein)		
Phenolphthalein	$(HOC_6H_4)_2CC_6H_4COO$	318.31
Phenolsulfonphthalein (Phenol Red)	$(HOC_6H_4)_2CC_6H_4SO_2O$	354.36
Phenothiazine (Thiodiphenylamine)	$C_{12}H_9NS$	199.26
Phenyl Isocyanide	C_6H_5NC	103.12
" Salicylate (Salol)	$HOC_6H_4COOC_6H_5$	214.21
Phenylamine (see Aniline)		
Phenylcarbinol (see Benzyl Alcohol)		
Phenylcinchoninic Acid (see Cinchophen)		
m-Phenylenediamine Dihydrochloride	$C_6H_4(NH_2)_2.2HCl$	181.07
Phenylethylmalonylurea (see Phenobarbital)		
Phenylhydrazine	$C_6H_5NHNH_2$	108.14
" Acetate	$C_6H_5NHNH_2.HC_2H_3O_2$	168.19
" Hydrochloride	$C_6H_5NHNH_2.HCl$	144.61
Phenylmercuric Chloride	C_6H_5HgCl	313.17
" Hydroxide	C_6H_5HgOH	294.72
" Nitrate	$C_6H_5HgNO_3$	339.72
Phenylquinolinecarboxylic Acid (see Cinchophen)		
Phenytoin (see Diphenylhydantoin)		
Phloroglucinol	$C_6H_3(OH)_3.2H_2O$	162.14
" anhydrous	$C_6H_3(OH)_3$	126.11
Phosphomolybdic Acid (approx.)	$20MoO_3.P_2O_5.51H_2O$	3939.78
Phosphoric Acid	H_3PO_4	98.00
" Anhydride (see Phosphorus Pentoxide)		
Phosphorus	**P**	**30.98**
Phosphorus Pentoxide (Phosphoric Anhydride)	P_2O_5	141.96
Phosphotungstic Acid	$24WO_3.P_2O_5.51H_2O$	6626.86
Physostigmine	$C_{15}H_{21}N_3O_2$	275.34
" Salicylate (Eserine Salicylate)	$C_{15}H_{21}N_3O_2.HC_7H_5O_3$	413.46
Picric Acid (see Trinitrophenol)		
Picrolonic Acid	$O_2NC_6H_4NN{:}C(CH_3)C(NO_2){:}COH$	264.20
Picrotoxin (Cocculin)	$C_{30}H_{34}O_{13}$	602.57
Pilocarpine	$C_{11}H_{16}N_2O_2$	208.25
" Hydrochloride	$C_{11}H_{16}N_2O_2.HCl$	244.72

Pilocarpine Nitrate	$C_{11}H_{16}N_2O_2.HNO_3$	271.27
Platinic Chloride (see Chloroplatinic Acid)		
Platinum	**Pt**	**195.23**
Potash, Caustic (see Potassium Hydroxide)		
Potassium	**K**	**39.096**
Potassium Acetate	CH_3COOK	98.14
" Acid Phthalate (see Potassium Biphthalate)		
" " Tartrate (see Potassium Bitartrate)		
" Alum (see Aluminum and Potassium Sulfate)		
" Arsenite (see Potassium Metarsenite)		
" Bicarbonate	$KHCO_3$	100.11
" Bichromate (see Potassium Dichromate)		
" Biphosphate (see Potassium Phosphate, Monobasic)		
" Biphthalate (Potassium Acid Phthalate)	$KOOCC_6H_4COOH$	204.22
" Bisulfate	$KHSO_4$	136.16
" Bitartrate (Potassium Acid Tartrate, Cream of Tartar)	$KOOC(CHOH)_2COOH$	188.18
" Bromate	$KBrO_3$	167.01
" Bromide	KBr	119.01
" Carbonate	$K_2CO_3.1\frac{1}{2}H_2O$	165.23
" " anhydrous	K_2CO_3	138.20
" Chlorate	$KClO_3$	122.55
" Chloride	KCl	74.55
" Chromate	K_2CrO_4	194.20
" Citrate	$C_3H_4OH(COOK)_3.H_2O$	324.40
" " anhydrous	$C_3H_4OH(COOK)_3$	306.39
" Cyanide	KCN	65.11
" Dichromate (Potassium Bichromate)	$K_2Cr_2O_7$	294.21
" Ferricyanide	$K_3Fe(CN)_6$	329.25
" Ferrocyanide	$K_4Fe(CN)_6.3H_2O$	422.39
" " anhydrous	$K_4Fe(CN)_6$	368.34
" Fluoride	$KF.2H_2O$	94.13
" " anhydrous	KF	58.10
" Guaiacolsulfonate	$(HO)(CH_3O)C_6H_3SO_3K$	242.28
" Hydroxide (Caustic Potash)	KOH	56.10
" Hypophosphite	KPH_2O_2	104.09
" Iodate	KIO_3	214.02
" Iodide	KI	166.02
" Metarsenite (Potassium Arsenite)	$KAsO_2$	146.01
" Nitrate (Saltpeter)	KNO_3	101.10
" Nitrite	KNO_2	85.10
" Oxalate	$(COOK)_2.H_2O$	184.23
" " anhydrous	$(COOK)_2$	166.21
" Perchlorate	$KClO_4$	138.55
" Permanganate	$KMnO_4$	158.03

Potassium Phosphate, Dibasic (Dipotassium Phosphate)	K_2HPO_4	174.18
" Phosphate, Monobasic (Monopotassium Phosphate, Potassium Biphosphate)	KH_2PO_4	136.09
" Rhodanate (see Potassium Thiocyanate)		
" Sodium Tartrate (Rochelle Salt)	$KOOC(CHOH)_2COONa.4H_2O$	282.23
" " " anhydrous	$KOOC(CHOH)_2COONa$	210.17
" Sulfate	K_2SO_4	174.25
" Thiocyanate (Potassium Rhodanate, Potassium Sulfocyanate, Potassium Sulfocyanide)	KSCN	97.17
" Xanthogenate (Potassium Xanthate)	C_2H_5OCSSK	160.29
Praseodymium	**Pr**	**140.92**
Procaine Hydrochloride (Procaine)	$H_2NC_6H_4COOCH_2CH_2N(C_2H_5)_2.HCl$	272.77
Proflavine	$C_{13}H_{11}N_3$	209.24
" Dihydrochloride	$C_{13}H_{11}N_3.2HCl.?H_2O$	318.20
" " anhydrous	$C_{13}H_{11}N_3.2HCl$	282.17
" Sulfate	$C_{13}H_{11}N_3.H_2SO_4.H_2O$	325.33
" " anhydrous	$C_{13}H_{11}N_3.H_2SO_4$	307.32
Progesterone	$C_{21}H_{30}O_2$	314.45
1,2-Propanediol (see Propylene Glycol)		
1-Propanol (see Propyl Alcohol, normal)		
2-Propanol (see Isopropyl Alcohol)		
p-Propenylanisole (see Anethole)		
Propyl Alcohol, normal (1-Propanol)	$CH_3CH_2CH_2OH$	60.09
" *p*-Hydroxybenzoate (see Propylben)		
Propylparaben (Propyl *p*-Hydroxybenzoate)	$HOC_6H_4COOCH_2CH_2CH_3$	180.20
Propylene Glycol (1,2-Propanediol)	$CH_3CHOHCH_2OH$	76.09
Protoactinium	**Pa**	**231.**
Pyridine	C_5H_5N	79.10
Pyridoxine Hydrochloride (Vitamin B_6, Vitamin B_6 Hydrochloride)	$C(CH_3):COHC(CH_2OH):C(CH_2OH)CH:N.HCl$	205.64
Pyrogallol (Pyrogallic Acid)	$C_6H_3(OH)_3$	126.11
Pyrrole	$NHCH:CHCH:CH$	67.09
Quicklime (see Calcium Oxide)		
Quicksilver (see Mercury)		
Quinacrine (Mepacrine)	$C_{23}H_{30}ClN_3O$	399.95
" Hydrochloride (Mepacrine Hydrochloride)	$C_{23}H_{30}ClN_3O.2HCl.2H_2O$	508.91
" " anhydrous	$C_{23}H_{30}ClN_3O.2HCl$	472.89
Quinidine, anhydrous	$C_{20}H_{24}N_2O_2$	324.41
" Sulfate	$(C_{20}H_{24}N_2O_2)_2.H_2SO_4.2H_2O$	782.92

Quinidine, Sulfate anhydrous	$(C_{20}H_{24}N_2O_2)_2\ H_2SO_4$	746 89
Quinine	$C_{20}H_{24}N_2O_2\ 3H_2O$	378 46
" anhydrous	$C_{20}H_{24}N_2O_2$	324.41
" and Urea Hydrochloride	$C_{20}H_{24}N_2O_2\ HCl\ CO(NH_2)_2\ HCl\ 5H_2O$	547.48
" " " " anhydrous	$C_{20}H_{24}N_2O_2\ HCl\ CO(NH_2)_2\ HCl$	457 40
" Bisulfate (Quinine Acid Sulfate)	$C_{20}H_{24}N_2O_2\ H_2SO_4\ 7H_2O$	548 60
" " anhydrous	$C_{20}H_{24}N_2O_2\ H_2SO_4$	422 48
" Dihydrochloride	$C_{20}H_{24}N_2O_2\ 2HCl$	397 34
" Ethylcarbonate (Euquinine)	$C_{23}H_{28}N_2O_4$	396 47
" Hydrobromide	$C_{20}H_{24}N_2O_2\ HBr\ H_2O$	423 35
" " anhydrous	$C_{20}H_{24}N_2O_2\ HBr$	405 34
" Hydrochloride	$C_{20}H_{24}N_2O_2\ HCl\ 2H_2O$	396 91
" " anhydrous	$C_{20}H_{24}N_2O_2\ HCl$	360 87
" Phosphate (approx)	$(C_{20}H_{24}N_2O_2)_3\ 2H_3PO_4\ 5H_2O$	1259 31
" " anhydrous	$(C_{20}H_{24}N_2O_2)_3\ 2H_3PO_4$	1169 23
" Salicylate	$C_{20}H_{24}N_2O_2\ HC_7H_5O_3\ H_2O$	480 54
" " anhydrous	$C_{20}H_{24}N_2O_2\ HC_7H_5O_3$	462 53
" Sulfate	$(C_{20}H_{24}N_2O_2)_2\ H_2SO_4\ 2H_2O$	782.92
" " anhydrous	$(C_{20}H_{24}N_2O_2)_2\ H_2SO_4$	746 89
Radium	Ra	226.05
Radon	Rn	222.
Red No 2, F D and C (see Amaranth)		
" Precipitate (see Mercuric Oxide)		
Reduced Iron (see Iron)		
Reinecke Salt (see Ammonium Reineckate)		
Resazurin Sodium	$C_{12}H_6NO_4Na$	251.17
Resorcin Brown (D and C Brown No 1)	$C_{20}H_{17}N_4O_5NaS$	448 43
Resorcinol (Resorcin, *m*-Dihydroxybenzene)	$C_6H_4(OH)_2$	110 11
" Monoacetate (Resorcin Acetate)	$CH_3COOC_6H_4OH$	152.14
Resorcinolphthalein (see Fluorescein)		
l-Rhamnose (Isodulcitol)	$C_6H_{12}O_5\ H_2O$	182 17
" anhydrous	$C_6H_{12}O_5$	164 16
Rhenium	Re	186.31
Rhodium	Rh	102.91
Riboflavin (Lactoflavin, Vitamin B_2, Vitamin G)	$C_{17}H_{20}N_4O_6$	376.36
Rochelle Salt (see Potassium Sodium Tartrate)		
Rubidium	Rb	85.48
Ruthenium	Ru	101.7
Saccharin (Benzosulfinide, Gluside)	$C_6H_4CONHSO_2$.	183.18
" Sodium (Soluble Benzosulfinide, Soluble Gluside, Soluble Saccharin)	$C_6H_4CONNaSO_2\ 2H_2O$	241.20

Saccharin Sodium, anhydrous	$C_6H_4CONNaSO_2$	205.17
Salicin	$HOCH_2C_6H_4OC_6H_{11}O_5$	286.27
Salicylaldehyde (*o*-Hydroxybenzaldehyde)	HOC_6H_4CHO	122.12
Salicylic Acid	HOC_6H_4COOH	138.12
Salol (see Phenyl Salicylate)		
Saltpeter (see Potassium Nitrate)		
Samarium	Sm	150.43
Santalol	$C_{15}H_{23}OH$	220.34
Santonin	$C_{15}H_{18}O_3$	246.29
Scarlet Red (Biebrich Scarlet Red, Medicinal Scarlet Red)	$C_{24}H_{20}N_4O$	380.43
Scandium	Sc	45.10
Scopolamine (Hyoscine)	$C_{17}H_{21}NO_4$	303.35
" Hydrobromide (Hyoscine Hydrobromide)	$C_{17}H_{21}NO_4.HBr.3H_2O$	438.32
" " anhydrous	$C_{17}H_{21}NO_4.HBr$	384.27
Selenious acid	H_2SeO_3	128.98
Selenium	Se	78.96
Semicarbazide Hydrochloride	$H_2NCONHNH_2.HCl$	111.54
Silicon	Si	28.06
Silicon Dioxide (Silica)	SiO_2	60.06
Silver	Ag	107.880
Silver Bromide	AgBr	187.80
" Chloride	AgCl	143.34
" Cyanide	AgCN	133.90
" Iodide	AgI	234.80
" Nitrate	$AgNO_3$	169.89
" Sulfate	Ag_2SO_4	311.82
Soda, Baking (see Sodium Bicarbonate)		
" Caustic (see Sodium Hydroxide)		
Sodium	Na	22.997
Sodium Acetate	$CH_3COONa.3H_2O$	136.09
" " anhydrous	CH_3COONa	82.04
" Acid Phosphate (see Sodium Biphosphate)		
" " Sulfite (see Sodium Bisulfite)		
" Alizarinsulfonate (Alizarin Red S)	$C_{14}H_5O_2(OH)_2(SO_3Na).H_2O$	360.27
" Ammonium Phosphate (Microcosmic Salt)	$NaNH_4HPO_4.4H_2O$	209.09
" Ammonium Phosphate anhydrous	$NaNH_4HPO_4$	137.03
" Arsenate	$Na_2HAsO_4.7H_2O$	312.02
" " anhydrous	Na_2HAsO_4	185.91
" Arsenite (see Sodium Metarsenite)		
" Ascorbate	$C_6H_7O_6Na$	198.11
" Benzoate	C_6H_5COONa	144.11

Sodium Benzosulfinide (see Saccharin Sodium)		
" Bicarbonate (Baking Soda)	$NaHCO_3$	84.02
" Bichromate (see Sodium Dichromate)		
" Biphosphate (Monosodium Orthophosphate, Sodium Acid Phosphate, Sodium Dihydrogen Phosphate)	$NaH_2PO_4.H_2O$	138.01
" Biphosphate, anhydrous	NaH_2PO_4	119.99
" Bisulfite (Sodium Acid Sulfite)	$NaHSO_3$	104.07
" Bitartrate	$NaOOC(CHOH)_2COOH.H_2O$	190.09
" " anhydrous	$NaOOC(CHOH)_2COOH$	172.08
" Borate (Borax, Sodium Tetraborate)	$Na_2B_4O_7.10H_2O$	381.43
" " anhydrous	$Na_2B_4O_7$	201.27
" Bromide	$NaBr$	102.91
" Cacodylate	$(CH_3)_2AsOONa.3H_2O$	214.02
" " anhydrous	$(CH_3)_2AsOONa$	159.98
" Carbonate, anhydrous	Na_2CO_3	106.00
" " Monohydrated	$Na_2CO_3.H_2O$	124.02
" Chloride	$NaCl$	58.45
" Citrate	$C_3H_4OH(COONa)_3.2H_2O$	294.12
" " anhydrous	$C_3H_4OH(COONa)_3$	258.09
" Cobaltinitrite	$Na_3Co(NO_2)_6$	403.98
" Cyanide	$NaCN$	49.02
" Desoxycholate	$C_{24}H_{39}O_4Na$	414.55
" 3,3′-Diamino-4,4′-dihydroxyarsenobenzene-N-methanalsulfoxylate	$H_2N(HO)C_6H_3As_2C_6H_3(OH)NHCH_2OSONa$	434.07
" Dichromate (Sodium Bichromate)	$Na_2Cr_2O_7.2H_2O$	298.05
" " anhydrous	$Na_2Cr_2O_7$	262.01
" Diethyldithiocarbamate	$(C_2H_5)_2NCSSNa$	171.26
" Dihydrogen Phosphate (see Sodium Biphosphate)		
" Fluoride	NaF	42.00
" Glycerophosphate, anhydrous	$C_3H_5(OH)_2OPO_3Na_2$	216.06
" Glycocholate	$C_{26}H_{42}NO_6Na$	487.60
" Hydrosulfite	$Na_2S_2O_4$	174.11
" Hydroxide (Caustic Soda)	$NaOH$	40.01
" Hypobromite	$NaBrO$	118.91
" Hypochlorite	$NaClO$	74.45
" Hypophosphite	$NaPH_2O_2.H_2O$	106.01
" " anhydrous	$NaPH_2O_2$	87.99
" Hyposulfite (see Sodium Thiosulfate)		
" Indigotindisulfonate (Indigo Carmine)	$C_{16}H_8N_2O_2(SO_3Na)_2$	466.35
" Iodide	NaI	149.92
" Lactate	$CH_3CHOHCOONa$	112.07
" Lauryl Sulfate	$CH_3(CH_2)_{11}OSO_3Na$	288.38
" Metarsenite (Sodium Arsenite)	$NaAsO_2$	129.91
" Nitrate	$NaNO_3$	85.01

Sodium Nitrite	$NaNO_2$	69.01
" Nitroprusside (Sodium Nitroferricyanide)	$Na_2Fe(NO)(CN)_5\cdot 2H_2O$	297.97
" " anhydrous	$Na_2Fe(NO)(CN)_5$	279.94
" Oxalate	$(COONa)_2$	134.01
" Palmitate	$C_{15}H_{31}COONa$	278.41
" Perborate	$NaBO_3\cdot 4H_2O$	153.88
" " anhydrous	$NaBO_3$	81.82
" Perchlorate	$NaClO_4\cdot H_2O$	140.47
" " anhydrous	$NaClO_4$	122.45
" Periodate (*p*-Sodium Periodate)	$Na_3H_2IO_6$	293.93
" Peroxide	Na_2O_2	77.99
" Phosphate (Disodium Phosphate)	$Na_2HPO_4\cdot 7H_2O$	268.09
" " anhydrous	Na_2HPO_4	141.98
" Propionate	CH_3CH_2COONa	96.07
" Pyrophosphate (Tetrasodium Pyrophosphate)	$Na_4P_2O_7\cdot 10H_2O$	446.11
" " anhydrous	$Na_4P_2O_7$	265.95
" Salicylate	HOC_6H_4COONa	160.11
" Selenite, anhydrous	Na_2SeO_3	172.95
" Stearate	$C_{17}H_{35}COONa$	306.46
" Sulfate (Glauber's Salt)	$Na_2SO_4\cdot 10H_2O$	322.21
" " anhydrous	Na_2SO_4	142.05
" Sulfide	$Na_2S\cdot 9H_2O$	240.20
" " anhydrous	Na_2S	78.05
" Sulfite, heptahydrate	$Na_2SO_3\cdot 7H_2O$	252.17
" " anhydrous	Na_2SO_3	126.05
" Sulfocyanate (see Sodium Thiocyanate)		
" Tartrate	$NaOOC(CHOH)_2COONa\cdot 2H_2O$	230.10
" " anhydrous	$NaOOC(CHOH)_2COONa$	194.07
" Tetraborate (see Sodium Borate)		
" Tetrabromofluorescein (see Eosin Y)		
" Thiocyanate (Sodium Sulfocyanate)	$NaSCN$	81.08
" Thioglycollate	$HSCH_2COONa$	114.10
" Thiosulfate (Sodium Hyposulfite)	$Na_2S_2O_3\cdot 5H_2O$	248.19
" " anhydrous	$Na_2S_2O_3$	158.11
" Tungstate	$Na_2WO_4\cdot 2H_2O$	329.95
" " anhydrous	Na_2WO_4	293.91
Sparteine	$C_{15}H_{26}N_2$	234.37
" Sulfate	$C_{15}H_{26}N_2\cdot H_2SO_4\cdot 5H_2O$	422.53
" " anhydrous	$C_{15}H_{26}N_2\cdot H_2SO_4$	332.45
Stannous Chloride	$SnCl_2\cdot 2H_2O$	225.65
" " anhydrous	$SnCl_2$	189.61
Stearic Acid	$CH_3(CH_2)_{16}COOH$	284.47
Stearyl Alcohol	$CH_3(CH_2)_{16}CH_2OH$	270.48

Stibophen	$C_{12}H_4O_{16}Na_5SbS_4.7H_2O$	895.25
" anhydrous	$C_{12}H_4O_{16}Na_5SbS_4$	769.14
Stilbestrol (see Diethylstilbestrol)		
Strontium	Sr	87.63
Strontium Bromide	$SrBr_2.6H_2O$	355.56
" " anhydrous	$SrBr_2$	247.46
" Salicylate	$(HOC_6H_4COO)_2Sr.2H_2O$	397.88
" " anhydrous	$(HOC_6H_4COO)_2Sr$	361.85
Strychnine	$C_{21}H_{22}N_2O_2$	334.40
" Nitrate	$C_{21}H_{22}N_2O_2.HNO_3$	397.42
" Phosphate	$C_{21}H_{22}N_2O_2.H_3PO_4.2H_2O$	468.44
" " anhydrous	$C_{21}H_{22}N_2O_2.H_3PO_4$	432.41
" Sulfate	$(C_{21}H_{22}N_2O_2)_2.H_2SO_4.5H_2O$	856.96
" " anhydrous	$(C_{21}H_{22}N_2O_2)_2.H_2SO_4$	766.88
Succinchlorimide	$COCH_2CH_2CONCl$	133.54
Succinylsulfathiazole	$HOOC(CH_2)_2CONHC_6H_4SO_2NHC_3H_2NS.H_2O$	373.39
" anhydrous	$HOOC(CH_2)_2CONHC_6H_4SO_2NHC_3H_2NS$	355.37
Sucrose (Sugar)	$C_{12}H_{22}O_{11}$	342.30
" Octaäcetate	$C_{28}H_{38}O_{19}$	678.58
Sugar of Lead (see Lead Acetate)		
Sulfadiazine	$H_2NC_6H_4SO_2NHC_4H_3N_2$	250.27
" Sodium	$H_2NC_6H_4SO_2NNaC_4H_3N_2$	272.26
Sulfaguanidine	$H_2NC_6H_4SO_2NHC(NH_2):NH.H_2O$	232.26
" anhydrous	$H_2NC_6H_4SO_2NHC(NH_2):NH$	214.24
Sulfamerazine	$H_2NC_6H_4SO_2NHC_4H_2N_2CH_3$	264.30
" Sodium	$H_2NC_6H_4SO_2NNaC_4H_2N_2CH_3$	286.29
Sulfanilamide	$H_2NC_6H_4SO_2NH_2$	172.20
Sulfanilic Acid	$H_2NC_6H_4SO_3H.H_2O$	191.20
" " anhydrous	$H_2NC_6H_4SO_3H$	173.18
Sulfapyridine	$H_2NC_6H_4SO_2NHC_5H_4N$	249.28
" Sodium	$H_2NC_6H_4SO_2NNaC_5H_4N.H_2O$	289.29
" " anhydrous	$H_2NC_6H_4SO_2NNaC_5H_4N$	271.27
Sulfathiazole	$H_2NC_6H_4SO_2NHC_3H_2NS$	255.31
" Sodium	$H_2NC_6H_4SO_2NNaC_3H_2NS.1\frac{1}{2}H_2O$	304.32
" " anhydrous	$H_2NC_6H_4SO_2NNaC_3H_2NS$	277.30
Sulfobromophthalein	$C_{20}H_{10}Br_4O_{10}S_2$	794.06
" Sodium	$C_{20}H_8Br_4O_{10}Na_2S_2$	838.04
Sulfonethylmethane	$(C_2H_5SO_2)_2C(CH_3)C_2H_5$	242.34
Sulfonmethane (Sulfonal)	$(C_2H_5SO_2)_2C(CH_3)_2$	228.32
Sulfosalicylic Acid	$C_6H_3(OH)(SO_3H)COOH.2H_2O$	254.21
" " anhydrous	$C_6H_3(OH)(SO_3H)COOH$	218.18
Sulfur	S	32.06
" Dioxide	SO_2	64.06
" Trioxide	SO_3	80.06
Sulfuric Acid	H_2SO_4	98.08
Sulfurous Acid	H_2SO_3	82.08
Suramin Sodium (Bayer 205, Naphuride)	$C_{51}H_{34}N_6O_{23}Na_6S_6$	1429.17

Tantalum	***Ta***	***180.88***
Tartar Emetic (see Antimony Potassium Tartrate)		
Tartaric Acid	*$HOOC(CHOH)_2COOH$*	*150.09*
Tellurium	***Te***	***127.61***
Terbium	***Tb***	***159.2***
Terpin Hydrate	$(CH_3)(HO)C_6H_9C(CH_3)_2OH.H_2O$	190.28
Testosterone Propionate	$CH_3CH_2COOC_{19}H_{27}O$	344.48
Tetiothalein Sodium (see Iodophthalein Sodium)		
Tetrabromofluorescein Sodium (Tetrabromofluorescein Soluble) (see Eosin Y)		
Tetrabromophenolsulfonphthalein (see Bromophenol Blue)		
Tetracaine	$C_4H_9NHC_6H_4COOCH_2CH_2N(CH_3)_2$	264.35
" Hydrochloride (Amethocaine Hydrochloride)	$C_4H_9NHC_6H_4COOCH_2CH_2N(CH_3)_2.HCl$	300.82
Tetrachlorobenzoquinone (see Chloranil)		
Tetrachloroethylene (Perchloroethylene)	$Cl_2C:CCl_2$	165.85
Tetraiodofluorescein (see Iodeosin)		
Tetraiodophenolphthalein Sodium (Tetraiodophthalein Sodium) (see Iodophthalein Sodium)		
Tetramethylpararosaniline Chloride	$[(CH_3)_2NC_6H_4]_2[H_2NC_6H_4]CCl$	379.92
Tetranitrol (see Erythrityl Tetranitrate)		
Tetrasodium Pyrophosphate (see Sodium Pyrophosphate)		
Thallium	**Tl**	**204.39**
Theelin (see Estrone)		
Theobromine	$C_7H_8N_4O_2$	180.17
" Sodium	$C_7H_7N_4O_2Na$	202.16
Theophylline	$C_7H_8N_4O_2.H_2O$	198.18
" anhydrous	$C_7H_8N_4O_2$	180.17
" Ethylenediamine (see Aminophylline)		
" Sodium	$C_7H_7N_4O_2Na$	202.16
Thiamine Hydrochloride (Aneurine Hydrochloride, Thiamin Chloride, Vitamin B_1, Vitamin B_1 Hydrochloride)	$C_{12}H_{17}ClN_4OS.HCl$	337.27
Thiodiphenylamine (see Phenothiazine)		
Thioglycollic Acid	$HSCH_2COOH$	92.11
Thiopental Sodium (Thiopental Soluble)	$NHC(SNa):NCOC[CH(CH_3)C_3H_7][C_2H_5]CO$	264.32
Thorium	**Th**	**232.12**
Thorium Nitrate, anhydrous	$Th(NO_3)_4$	480.15
Thujone	$C_{10}H_{16}O$	152.23
Thulium	**Tm**	**169.4**
Thymol	$CH_3(HO)C_6H_3CH(CH_3)_2$	150.21
" Blue	$C_{27}H_{30}O_5S$	466.57
" Iodide (see Dithymol Diiodide)		
Thymolphthalein	$C_{28}H_{30}O_4$	430.52
Thyroxin	$HOC_6H_2I_2OC_6H_2I_2CH_2CH(NH_2)COOH$	776.93
Tin	**Sn**	**118.70**
Tin Compounds (see under Stannous)		

Titanium	Ti	47.90
Titanium Dioxide	TiO_2	79.90
" Trichloride	$TiCl_3$	154.27
o-Tolidine	$(H_2N)(CH_3)C_6H_3C_6H_3(CH_3)(NH_2)$	212.28
Toluene (Toluol)	$C_6H_5CH_3$	92.13
p-Toluenesulfondichloramide (see Dichloramine-T)		
Triacetin (see Glyceryl Triacetate)		
Tribromoethanol (Tribromoethyl Alcohol)	CBr_3CH_2OH	282.79
Trichloroacetic Acid	CCl_3COOH	163.40
Trichloroethylene	$CCl_2{:}CHCl$	131.40
Triethanolamine	$(HOCH_2CH_2)_3N$	149.19
Triïodomethane (see Iodoform)		
Triketohydrindene Hydrate (Ninhydrin)	$C_6H_4.COCOCO.H_2O$	178.14
Trimethylene (see Cyclopropane)		
Trinitrin (see Glyceryl Trinitrate)		
Trinitrophenol (Picric Acid)	$C_6H_2(NO_2)_3OH$	229.11
Triphenylchloromethane (Trityl Chloride)	$(C_6H_5)_3CCl$	278.77
Tropæolin D (see Methyl Orange)		
Tryparsamide	$H_2NCOCH_2NHC_6H_4AsO(OH)ONa.\frac{1}{2}H_2O$	305.09
" anhydrous	$H_2NCOCH_2NHC_6H_4AsO(OH)ONa$	296.08
l-Tryptophane	$C_8H_6N.CH_2CH(NH_2)COOH$	204.22
Tungsten	W	183.92
Uracil	$NHCONHCH{:}CHCO$	112.09
Uranium	U	238.07
Uranyl Acetate (Uranium Acetate)	$UO_2(C_2H_3O_2)_2.2H_2O$	424.19
" " anhydrous	$UO_2(C_2H_3O_2)_2$	388.16
Urea (Carbamide)	$CO(NH_2)_2$	60.06
Urethane (see Ethyl Carbamate)		
Uric Acid	$C_5H_4N_4O_3$	168.11
Valeric Acid (Valerianic Acid)	$CH_3(CH_2)_3COOH$	102.13
Vanadium	V	50.95
Vanillin	$HOC_6H_3(OCH_3)CHO$	152.14
Vinyl Ether (Divinyl Oxide)	$(CH_2{:}CH)_2O$	70.09
Viosterol (see Calciferol)		
Vitamin B_1 (see Thiamine Hydrochloride)		
" B_2 (see Riboflavin)		
" B_6 (see Pyridoxine Hydrochloride)		
" C (see Ascorbic Acid)		
" D_2 (see Calciferol)		
" D_3 (see 7-Dehydrocholesterol, Activated)		
" G (see Riboflavin)		
Water	H_2O	18.02

White Precipitate (see Mercury, Ammoniated)

Xanthine	$C_5H_4N_4O_2$	152.11
Xenon	**Xe**	**131.3**
Xylene (Xylol)	$C_6H_4(CH_3)_2$	106.16
l-Xylose	$C_5H_{10}O_5$	150.13

Yellow Precipitate (see Mercuric Oxide)

Ytterbium	**Yb**	**173.04**
Yttrium	**Y**	**88.92**

Zinc	**Zn**	**65.38**
Zinc Acetate	$(CH_3COO)_2Zn.2H_2O$	219.50
" " anhydrous	$(CH_3COO)_2Zn$	183.47
" Chloride	$ZnCl_2$	136.29
" Hydroxide	$Zn(OH)_2$	99.40
" Iodide	ZnI_2	319.22
" Oxide	ZnO	81.38
" Peroxide	ZnO_2	97.38
" Phenolsulfonate (Zinc Sulfocarbolate)	$(HOC_6H_4SO_3)_2Zn.8H_2O$	555.83
" " anhydrous	$(HOC_6H_4SO_3)_2Zn$	411.70
" Stearate	$[CH_3(CH_2)_{16}COO]_2Zn$	632.30
" Sulfate	$ZnSO_4.7H_2O$	287.55
" " anhydrous	$ZnSO_4$	161.44
" Sulfide	ZnS	97.44
" Sulfocarbolate (see Zinc Phenolsulfonate)		
Zirconium	**Zr**	**91.22**

Alcoholometric Table

Computed by the United States Bureau of Standards and based upon work done by the Bufeau and published in Bureau of Standards Bulletin, Vol. 9, No. 3, pp. 424 and 425.

Percentage by Volume				Percentage by Weight			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at 25° C./25° C.	Specific gravity in air at 15.56° C./15.56° C.	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at 25° C./25° C.	Specific gravity in air at 15.56° C./15.56° C.
0	0.00	1.0000	1.0000	0	0.00	1.0000	1.0000
1	0.80	0.9985	0.9985	1	1.26	0.9981	0.9981
2	1.59	0.9970	0.9970	2	2.51	0.9963	0.9963
3	2.39	0.9956	0.9956	3	3.76	0.9945	0.9945
4	3.19	0.9941	0.9942	4	5.00	0.9927	0.9928
5	4.00	0.9927	0.9928	5	6.24	0.9911	0.9912
6	4.80	0.9914	0.9915	6	7.48	0.9894	0.9896
7	5.61	0.9901	0.9902	7	8.71	0.9879	0.9881
8	6.42	0.9888	0.9890	8	9.94	0.9863	0.9867
9	7.23	0.9875	0.9878	9	11.17	0.9848	0.9852
10	8.05	0.9862	0.9866	10	12.39	0.9833	0.9839
11	8.86	0.9850	0.9854	11	13.61	0.9818	0.9825
12	9.68	0.9838	0.9843	12	14.83	0.9804	0.9812
13	10.50	0.9826	0.9832	13	16.05	0.9789	0.9799
14	11.32	0.9814	0.9821	14	17.26	0.9776	0.9787
15	12.14	0.9802	0.9810	15	18.47	0 9762	0.9774
16	12.96	0.9790	0.9800	16	19.68	0.9748	0.9763
17	13.79	0.9778	0.9789	17	20.88	0.9734	0.9751
18	14.61	0.9767	0.9779	18	22.08	0.9720	0.9738
19	15.44	0.9756	0.9769	19	23.28	0.9706	0.9726
20	16.27	0.9744	0.9759	20	24.47	0.9692	0.9714
21	17.10	0.9733	0.9749	21	25.66	0.9677	0.9701
22	17.93	0.9721	0.9739	22	26.85	0.9663	0.9688
23	18.77	0.9710	0.9729	23	28.03	0.9648	0.9675
24	19.60	0.9698	0.9719	24	29.21	0.9633	0.9662
25	20.44	0.9685	0.9708	25	30.39	0.9617	0.9648
26	21.29	0.9673	0.9697	26	31.56	0.9601	0.9635
27	22.13	0.9661	0.9687	27	32.72	0.9585	0.9620
28	22.97	0.9648	0.9676	28	33.88	0.9568	0.9605
29	23.82	0.9635	0.9664	29	35.03	0.9551	0.9590
30	24.67	0.9622	0.9653	30	36.18	0.9534	0.9574

Alcoholometric Table—*Continued*

Percentage by Volume				Percentage by Weight			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at $\frac{25° C.}{25° C.}$	Specific gravity in air at $\frac{15.56° C.}{15.56° C.}$	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at $\frac{25° C.}{25° C.}$	Specific gravity in air at $\frac{15.56° C.}{15.56° C.}$
31	25.52	0.9609	0.9641	31	37.32	0.9516	0.9558
32	26.38	0.9595	0.9629	32	38.46	0.9498	0.9541
33	27.24	0.9581	0.9617	33	39.59	0.9480	0.9524
34	28.10	0.9567	0.9604	34	40.72	0.9461	0.9506
35	28.97	0.9552	0.9590	35	41.83	0.9442	0.9488
36	29.84	0.9537	0.9576	36	42.94	0.9422	0.9470
37	30.72	0.9521	0.9562	37	44.05	0.9402	0.9451
38	31.60	0.9506	0.9548	38	45.15	0.9382	0.9432
39	32.48	0.9489	0.9533	39	46.24	0.9362	0.9412
40	33.36	0.9473	0.9517	40	47.33	0.9341	0.9392
41	34.25	0.9456	0.9501	41	48.41	0.9320	0.9372
42	35.15	0.9439	0.9485	42	49.48	0.9299	0.9352
43	36.05	0.9421	0.9469	43	50.55	0.9278	0.9331
44	36.96	0.9403	0.9452	44	51.61	0.9256	0.9310
45	37.87	0.9385	0.9434	45	52.66	0.9235	0.9289
46	38.78	0.9366	0.9417	46	53.71	0.9213	0.9268
47	39.70	0.9348	0.9399	47	54.75	0.9191	0.9246
48	40.62	0.9328	0.9380	48	55.78	0.9169	0.9225
49	41.55	0.9309	0.9361	49	56.81	0.9147	0.9203
50	42.49	0.9289	0.9342	50	57.83	0.9124	0.9181
51	43.43	0.9269	0.9322	51	58.84	0.9102	0.9159
52	44.37	0.9248	0.9302	52	59.85	0.9079	0.9137
53	45.33	0.9228	0.9282	53	60.85	0.9056	0.9114
54	46.28	0.9207	0.9262	54	61.85	0.9033	0.9092
55	47.25	0.9185	0.9241	55	62.84	0.9010	0.9069
56	48.21	0.9164	0.9220	56	63.82	0.8987	0.9046
57	49.19	0.9142	0.9199	57	64.80	0.8964	0.9024
58	50.17	0.9120	0.9177	58	65.77	0.8941	0.9001
59	51.15	0.9098	0.9155	59	66.73	0.8918	0.8978
60	52.15	0.9076	0.9133	60	67.69	0.8895	0.8955
61	53.15	0.9053	0.9111	61	68.64	0.8871	0.8932
62	54.15	0.9030	0.9088	62	69.59	0.8848	0.8909
63	55.17	0.9006	0.9065	63	70.52	0.8824	0.8886
64	56.18	0.8983	0.9042	64	71.46	0.8801	0.8862
65	57.21	0.8959	0.9019	65	72.38	0.8777	0.8839
66	58.24	0.8936	0.8995	66	73.30	0.8753	0.8815
67	59.28	0.8911	0.8972	67	74.21	0.8729	0.8792
68	60.33	0.8887	0.8948	68	75.12	0.8706	0.8768
69	61.38	0.8862	0.8923	69	76.02	0.8682	0.8745
70	62.44	0.8837	0.8899	70	76.91	0.8658	0.8721

Alcoholometric Table—*Continued*

Percentage by Volume				Percentage by Weight			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at 25° C./25° C.	Specific gravity in air at 15.56° C./15.56° C.	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at 25° C./25° C.	Specific gravity in air at 15.56° C./15.56° C.
71	63.51	0.8812	0.8874	71	77.79	0.8634	0.8697
72	64.59	0.8787	0.8848	72	78.67	0.8609	0.8673
73	65.67	0.8761	0.8823	73	79.54	0.8585	0.8649
74	66.77	0.8735	0.8797	74	80.41	0.8561	0.8625
75	67.87	0.8709	0.8771	75	81.27	0.8537	0.8601
76	68.98	0.8682	0.8745	76	82.12	0.8512	0.8576
77	70.10	0.8655	0.8718	77	82.97	0.8488	0.8552
78	71.23	0.8628	0.8691	78	83.81	0.8463	0.8528
79	72.38	0.8600	0.8664	79	84.64	0.8439	0.8503
80	73.53	0.8572	0.8636	80	85.46	0.8414	0.8479
81	74.69	0.8544	0.8608	81	86.28	0.8389	0.8454
82	75.86	0.8516	0.8580	82	87.08	0.8364	0.8429
83	77.04	0.8487	0.8551	83	87.89	0.8339	0.8404
84	78.23	0.8458	0.8522	84	88.68	0.8314	0.8379
85	79.44	0.8428	0.8493	85	89.46	0.8288	0.8354
86	80.66	0.8397	0.8462	86	90.24	0.8263	0.8328
87	81.90	0.8367	0.8432	87	91.01	0.8237	0.8303
88	83.14	0.8335	0.8401	88	91.77	0.8211	0.8276
89	84.41	0.8303	0.8369	89	92.52	0.8184	0.8250
90	85.69	0.8271	0.8336	90	93.25	0.8158	0.8224
91	86.99	0.8237	0.8303	91	93.98	0.8131	0.8197
92	88.31	0.8202	0.8268	92	94.70	0.8104	0.8170
93	89.65	0.8167	0.8233	93	95.41	0.8076	0.8142
94	91.03	0.8130	0.8196	94	96.10	0.8048	0.8114
95	92.42	0.8092	0.8158	95	96.79	0.8020	0.8086
96	93.85	0.8053	0.8118	96	97.46	0.7992	0.8057
97	95.32	0.8011	0.8077	97	98.12	0.7962	0.8028
98	96.82	0.7968	0.8033	98	98.76	0.7932	0.7988
99	98.38	0.7921	0.7986	99	99.39	0.7902	0.7967
100	100.00	0.7871	0.7936	100	100.00	0.7871	0.7936

Thermometric Equivalents

Centigrade to Fahrenheit Scales

$$\frac{9}{5}\,C.^\circ + 32 = F.^\circ$$

C. °	F. °	C. °	F. °	C.°	F. °	C. °	F. °	C. °	F. °
−20	−4.0	21	69.8	61	141.8	101	213.8	141	285.8
−19	−2.2	22	71.6	62	143.6	102	215.6	142	287.6
−18	−0.4	23	73.4	63	145.4	103	217.4	143	289.4
−17	1.4	24	75.2	64	147.2	104	219.2	144	291.2
−16	3.2	25	77.	65	149.	105	221.	145	293.
−15	5.	26	78.8	66	150.8	106	222.8	146	294.8
−14	6.8	27	80.6	67	152.6	107	224.6	147	296.6
−13	8.6	28	82 4	68	154.4	108	226.4	148	298.4
−12	10.4	29	84.2	69	156.2	109	228.2	149	300.2
−11	12.2	30	86.	70	158.	110	230.	150	302.
−10	14.	31	87.8	71	159.8	111	231.8	151	303.8
− 9	15.8	32	89.6	72	161.6	112	233.6	152	305.6
− 8	17.6	33	91.4	73	163.4	113	235.4	153	307.4
− 7	19.4	34	93.2	74	165.2	114	237.2	154	309.2
− 6	21.2	35	95.	75	167.	115	239.	155	311.
− 5	23.	36	96.8	76	168.8	116	240.8	156	312.8
− 4	24.8	37	98.6	77	170.6	117	242.6	157	314.6
− 3	26.6	38	100.4	78	172.4	118	244.4	158	316.4
− 2	28.4	39	102.2	79	174.2	119	246.2	159	318.2
− 1	30.2	40	104.	80	176.	120	248.	160	320.
0	32.	41	105.8	81	177.8	121	249.8	161	321.8
1	33.8	42	107.6	82	179.6	122	251.6	162	323.6
2	35.6	43	109.4	83	181.4	123	253.4	163	325.4
3	37.4	44	111.2	84	183.2	124	255.2	164	327.2
4	39.2	45	113.	85	185.	125	257.	165	329.
5	41.	46	114.8	86	186.8	126	258.8	166	330.8
6	42.8	47	116.6	87	188.6	127	260.6	167	332.6
7	44.6	48	118.4	88	190.4	128	262.4	168	334.4
8	46.4	49	120.2	89	192.2	129	264.2	169	336.2
9	48.2	50	122.	90	194.	130	266.	170	338.
10	50.	51	123.8	91	195.8	131	267.8	171	339.8
11	51.8	52	125.6	92	197.6	132	269.6	172	341.6
12	53.6	53	127.4	93	199.4	133	271.4	173	343.4
13	55.4	54	129.2	94	201.2	134	273.2	174	345.2
14	57.2	55	131.	95	203.	135	275.	175	347.
15	59.	56	132.8	96	204.8	136	276.8	176	348.8
16	60.8	57	134.6	97	206.6	137	278.6	177	350.6
17	62.6	58	136.4	98	208.4	138	280.4	178	352.4
18	64.4	59	138.2	99	210.2	139	282.2	179	354.2
19	66.2	60	140.	100	212.	140	284.	180	356.
20	68.								

Thermometric Equivalents—*Continued*

Fahrenheit to Centigrade Scales

$$(F.° - 32) \times \frac{5}{9} = C.°$$

F. °	C. °	F. °	C. °	F. °	C. °	F. °	C. °	F. °	C. °
0	−17.78	51	10.56	101	38.33	151	66.11	201	93.89
1	−17.22	52	11.11	102	38.89	152	66.67	202	94.44
2	−16.67	53	11.67	103	39.44	153	67.22	203	95.
3	−16.11	54	12.22	104	40.	154	67.78	204	95.56
4	−15.56	55	12.78	105	40.56	155	68.33	205	96.11
5	−15.	56	13.33	106	41.11	156	68.89	206	96.67
6	−14.44	57	13.89	107	41.67	157	69.44	207	97.22
7	−13.89	58	14.44	108	42.22	158	70.	208	97.78
8	−13.33	59	15.	109	42.78	159	70.56	209	98.33
9	−12.78	60	15.56	110	43.33	160	71.11	210	98.89
10	−12.22	61	16.11	111	43.89	161	71.67	211	99.44
11	−11.67	62	16.67	112	44.44	162	72.22	212	100.
12	−11.11	63	17.22	113	45.	163	72.78	213	100.56
13	−10.56	64	17.78	114	45.56	164	73.33	214	101.11
14	−10.	65	18.33	115	46.11	165	73.89	215	101.67
15	−9.44	66	18.89	116	46.67	166	74.44	216	102.22
16	−8.89	67	19.44	117	47.22	167	75.	217	102.78
17	−8.33	68	20.	118	47.78	168	75.56	218	103.33
18	−7.78	69	20.56	119	48.33	169	76.11	219	103.89
19	−7.22	70	21.11	120	48.89	170	76.67	220	104.44
20	−6.67	71	21.67	121	49.44	171	77.22	221	105.
21	−6.11	72	22.22	122	50.	172	77.78	222	105.56
22	−5.56	73	22.78	123	50.56	173	78.33	223	106.11
23	−5.	74	23.33	124	51.11	174	78.89	224	106.67
24	−4.44	75	23.89	125	51.67	175	79.44	225	107.22
25	−3.89	76	24.44	126	52.22	176	80.	226	107.78
26	−3.33	77	25.	127	52.78	177	80.56	227	108.33
27	−2.78	78	25.56	128	53.33	178	81.11	228	108.89
28	−2.22	79	26.11	129	53.89	179	81.67	229	109.44
29	−1.67	80	26.67	130	54.44	180	82.22	230	110.
30	−1.11	81	27.22	131	55.	181	82.78	231	110.56
31	−0.56	82	27.78	132	55.56	182	83.33	232	111.11
32	0.	83	28.33	133	56.11	183	83.89	233	111.67
33	0.56	84	28.89	134	56.67	184	84.44	234	112.22
34	1.11	85	29.44	135	57.22	185	85.	235	112.78
35	1.67	86	30.	136	57.78	186	85.56	236	113.33
36	2.22	87	30.56	137	58.33	187	86.11	237	113.89
37	2.78	88	31.11	138	58.89	188	86.67	238	114.44
38	3.33	89	31.67	139	59.44	189	87.22	239	115.
39	3.89	90	32.22	140	60.	190	87.78	240	115.56
40	4.44	91	32.78	141	60.56	191	88.33	241	116.11
41	5.	92	33.33	142	61.11	192	88.89	242	116.67
42	5.56	93	33.89	143	61.67	193	89.44	243	117.22
43	6.11	94	34.44	144	62.22	194	90.	244	117.78
44	6.67	95	35.	145	62.78	195	90.56	245	118.33
45	7.22	96	35.56	146	63.33	196	91.11	246	118.89
46	7.78	97	36.11	147	63.89	197	91.67	247	119.44
47	8.33	98	36.67	148	64.44	198	92.22	248	120.
48	8.89	99	37.22	149	65.	199	92.78	249	120.56
49	9.44	100	37.78	150	65.56	200	93.33	250	121.11
50	10.								

Alcoholometric Table—*Continued*

Percentage by Volume				Percentage by Weight			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at $\frac{25° C.}{25° C.}$	Specific gravity in air at $\frac{15.56° C.}{15.56° C.}$	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at $\frac{25° C.}{25° C.}$	Specific gravity in air at $\frac{15.56° C.}{15.56° C.}$
31	25.52	0.9609	0.9641	31	37.32	0.9516	0.9558
32	26.38	0.9595	0.9629	32	38.46	0.9498	0.9541
33	27.24	0.9581	0.9617	33	39.59	0.9480	0.9524
34	28.10	0.9567	0.9604	34	40.72	0.9461	0.9506
35	28.97	0.9552	0.9590	35	41.83	0.9442	0.9488
36	29.84	0.9537	0.9576	36	42.94	0.9422	0.9470
37	30.72	0.9521	0.9562	37	44.05	0.9402	0.9451
38	31.60	0.9506	0.9548	38	45.15	0.9382	0.9432
39	32.48	0.9489	0.9533	39	46.24	0.9362	0.9412
40	33.36	0.9473	0.9517	40	47.33	0.9341	0.9392
41	34.25	0.9456	0.9501	41	48.41	0.9320	0.9372
42	35.15	0.9439	0.9485	42	49.48	0.9299	0.9352
43	36.05	0.9421	0.9469	43	50.55	0.9278	0.9331
44	36.96	0.9403	0.9452	44	51.61	0.9256	0.9310
45	37.87	0.9385	0.9434	45	52.66	0.9235	0.9289
46	38.78	0.9366	0.9417	46	53.71	0.9213	0.9268
47	39.70	0.9348	0.9399	47	54.75	0.9191	0.9246
48	40.62	0.9328	0.9380	48	55.78	0.9169	0.9225
49	41.55	0.9309	0.9361	49	56.81	0.9147	0.9203
50	42.49	0.9289	0.9342	50	57.83	0.9124	0.9181
51	43.43	0.9269	0.9322	51	58.84	0.9102	0.9159
52	44.37	0.9248	0.9302	52	59.85	0.9079	0.9137
53	45.33	0.9228	0.9282	53	60.85	0.9056	0.9114
54	46.28	0.9207	0.9262	54	61.85	0.9033	0.9092
55	47.25	0.9185	0.9241	55	62.84	0.9010	0.9069
56	48.21	0.9164	0.9220	56	63.82	0.8987	0.9046
57	49.19	0.9142	0.9199	57	64.80	0.8964	0.9024
58	50.17	0.9120	0.9177	58	65.77	0.8941	0.9001
59	51.15	0.9098	0.9155	59	66.73	0.8918	0.8978
60	52.15	0.9076	0.9133	60	67.69	0.8895	0.8955
61	53.15	0.9053	0.9111	61	68.64	0.8871	0.8932
62	54.15	0.9030	0.9088	62	69.59	0.8848	0.8909
63	55.17	0.9006	0.9065	63	70.52	0.8824	0.8886
64	56.18	0.8983	0.9042	64	71.46	0.8801	0.8862
65	57.21	0.8959	0.9019	65	72.38	0.8777	0.8839
66	58.24	0.8936	0.8995	66	73.30	0.8753	0.8815
67	59.28	0.8911	0.8972	67	74.21	0.8729	0.8792
68	60.33	0.8887	0.8948	68	75.12	0.8706	0.8768
69	61.38	0.8862	0.8923	69	76.02	0.8682	0.8745
70	62.44	0.8837	0.8899	70	76.91	0.8658	0.8721

Alcoholometric Table—*Continued*

Percentage by Volume				Percentage by Weight			
Per cent of C_2H_5OH by volume, at 15.56° C.	Corresponding per cent of C_2H_5OH by weight	Specific gravity in air at 25° C. / 25° C.	Specific gravity in air at 15.56° C. / 15.56° C.	Per cent of C_2H_5OH by weight	Corresponding per cent of C_2H_5OH by volume at 15.56° C.	Specific gravity in air at 25° C. / 25° C.	Specific gravity in air at 15.56° C. / 15.56° C.
71	63.51	0.8812	0.8874	71	77.79	0.8634	0.8697
72	64.59	0.8787	0.8848	72	78.67	0.8609	0.8673
73	65.67	0.8761	0.8823	73	79.54	0.8585	0.8649
74	66.77	0.8735	0.8797	74	80.41	0.8561	0.8625
75	67.87	0.8709	0.8771	75	81.27	0.8537	0.8601
76	68.98	0.8682	0.8745	76	82.12	0.8512	0.8576
77	70.10	0.8655	0.8718	77	82.97	0.8488	0.8552
78	71.23	0.8628	0.8691	78	83.81	0.8463	0.8528
79	72.38	0.8600	0.8664	79	84.64	0.8439	0.8503
80	73.53	0.8572	0.8636	80	85.46	0.8414	0.8479
81	74.69	0.8544	0.8608	81	86.28	0.8389	0.8454
82	75.86	0.8516	0.8580	82	87.08	0.8364	0.8429
83	77.04	0.8487	0.8551	83	87.89	0.8339	0.8404
84	78.23	0.8458	0.8522	84	88.68	0.8314	0.8379
85	79.44	0.8428	0.8493	85	89.46	0.8288	0.8354
86	80.66	0.8397	0.8462	86	90.24	0.8263	0.8328
87	81.90	0.8367	0.8432	87	91.01	0.8237	0.8303
88	83.14	0.8335	0.8401	88	91.77	0.8211	0.8276
89	84.41	0.8303	0.8369	89	92.52	0.8184	0.8250
90	85.69	0.8271	0.8336	90	93.25	0.8158	0.8224
91	86.99	0.8237	0.8303	91	93.98	0.8131	0.8197
92	88.31	0.8202	0.8268	92	94.70	0.8104	0.8170
93	89.65	0.8167	0.8233	93	95.41	0.8076	0.8142
94	91.03	0.8130	0.8196	94	96.10	0.8048	0.8114
95	92.42	0.8092	0.8158	95	96.79	0.8020	0.8086
96	93.85	0.8053	0.8118	96	97.46	0.7992	0.8057
97	95.32	0.8011	0.8077	97	98.12	0.7962	0.8028
98	96.82	0.7968	0.8033	98	98.76	0.7932	0.7988
99	98.38	0.7921	0.7986	99	99.39	0.7902	0.7967
100	100.00	0.7871	0.7936	100	100.00	0.7871	0.7936

Thermometric Equivalents

Centigrade to Fahrenheit Scales

$$\frac{9}{5}\text{C.}^\circ + 32 = \text{F.}^\circ$$

C. °	F. °	C. °	F. °	C.°	F. °	C. °	F. °	C. °	F. °
−20	−4.0	21	69.8	61	141.8	101	213.8	141	285.8
−19	−2.2	22	71.6	62	143.6	102	215.6	142	287.6
−18	−0.4	23	73.4	63	145.4	103	217.4	143	289.4
−17	1.4	24	75.2	64	147.2	104	219.2	144	291.2
−16	3.2	25	77.	65	149.	105	221.	145	293.
−15	5.	26	78.8	66	150.8	106	222.8	146	294.8
−14	6.8	27	80.6	67	152.6	107	224.6	147	296.6
−13	8.6	28	82 4	68	154.4	108	226.4	148	298.4
−12	10.4	29	84.2	69	156.2	109	228.2	149	300.2
−11	12.2	30	86.	70	158.	110	230.	150	302.
−10	14	31	87.8	71	159.8	111	231.8	151	303.8
− 9	15.8	32	89.6	72	161.6	112	233.6	152	305.6
− 8	17.6	33	91.4	73	163.4	113	235.4	153	307.4
− 7	19.4	34	93.2	74	165.2	114	237.2	154	309.2
− 6	21.2	35	95.	75	167.	115	239.	155	311.
− 5	23.	36	96.8	76	168.8	116	240.8	156	312.8
− 4	24.8	37	98.6	77	170.6	117	242.6	157	314.6
− 3	26.6	38	100.4	78	172.4	118	244.4	158	316.4
− 2	28.4	39	102.2	79	174.2	119	246.2	159	318.2
− 1	30.2	40	104.	80	176.	120	248.	160	320.
0	32.	41	105.8	81	177.8	121	249.8	161	321.8
1	33.8	42	107.6	82	179.6	122	251.6	162	323.6
2	35.6	43	109.4	83	181.4	123	253.4	163	325.4
3	37.4	44	111.2	84	183.2	124	255.2	164	327.2
4	39.2	45	113.	85	185.	125	257.	165	329.
5	41.	46	114.8	86	186.8	126	258.8	166	330.8
6	42.8	47	116.6	87	188.6	127	260.6	167	332.6
7	44.6	48	118.4	88	190.4	128	262.4	168	334.4
8	46.4	49	120.2	89	192.2	129	264.2	169	336.2
9	48.2	50	122.	90	194.	130	266.	170	338.
10	50.	51	123.8	91	195.8	131	267.8	171	339.8
11	51.8	52	125.6	92	197.6	132	269.6	172	341.6
12	53.6	53	127.4	93	199.4	133	271.4	173	343.4
13	55.4	54	129.2	94	201.2	134	273.2	174	345.2
14	57.2	55	131.	95	203.	135	275.	175	347.
15	59.	56	132.8	96	204.8	136	276.8	176	348.8
16	60.8	57	134.6	97	206.6	137	278.6	177	350.6
17	62.6	58	136.4	98	208.4	138	280.4	178	352.4
18	64.4	59	138.2	99	210.2	139	282.2	179	354.2
19	66.2	60	140.	100	212.	140	284.	180	356.
20	68.								

Thermometric Equivalents—*Continued*

Fahrenheit to Centigrade Scales

$$(F.° - 32) \times \frac{5}{9} = C.°$$

F. °	C. °	F. °	C. °	F. °	C. °	F. °	C. °	F. °	C. °
0	−17.78	51	10.56	101	38.33	151	66.11	201	93.89
1	−17.22	52	11.11	102	38.89	152	66.67	202	94.44
2	−16.67	53	11.67	103	39.44	153	67.22	203	95.
3	−16.11	54	12.22	104	40.	154	67.78	204	95.56
4	−15.56	55	12.78	105	40.56	155	68.33	205	96.11
5	−15.	56	13.33	106	41.11	156	68.89	206	96.67
6	−14.44	57	13.89	107	41.67	157	69.44	207	97.22
7	−13.89	58	14.44	108	42.22	158	70.	208	97.78
8	−13.33	59	15.	109	42.78	159	70.56	209	98.33
9	−12.78	60	15.56	110	43.33	160	71.11	210	98.89
10	−12.22	61	16.11	111	43.89	161	71.67	211	99.44
11	−11.67	62	16.67	112	44.44	162	72.22	212	100.
12	−11.11	63	17.22	113	45.	163	72.78	213	100.56
13	−10.56	64	17.78	114	45.56	164	73.33	214	101.11
14	−10.	65	18.33	115	46.11	165	73.89	215	101.67
15	−9.44	66	18.89	116	46.67	166	74.44	216	102.22
16	−8.89	67	19.44	117	47.22	167	75.	217	102.78
17	−8.33	68	20.	118	47.78	168	75.56	218	103.33
18	−7.78	69	20.56	119	48.33	169	76.11	219	103.89
19	−7.22	70	21.11	120	48.89	170	76.67	220	104.44
20	−6.67	71	21.67	121	49.44	171	77.22	221	105.
21	−6.11	72	22.22	122	50.	172	77.78	222	105.56
22	−5.56	73	22.78	123	50.56	173	78.33	223	106.11
23	−5.	74	23.33	124	51.11	174	78.89	224	106.67
24	−4.44	75	23.89	125	51.67	175	79.44	225	107.22
25	−3.89	76	24.44	126	52.22	176	80.	226	107.78
26	−3.33	77	25.	127	52.78	177	80.56	227	108.33
27	−2.78	78	25.56	128	53.33	178	81.11	228	108.89
28	−2.22	79	26.11	129	53.89	179	81.67	229	109.44
29	−1.67	80	26.67	130	54.44	180	82.22	230	110.
30	−1.11	81	27.22	131	55.	181	82.78	231	110.56
31	−0.56	82	27.78	132	55.56	182	83.33	232	111.11
32	0.	83	28.33	133	56.11	183	83.89	233	111.67
33	0.56	84	28.89	134	56.67	184	84.44	234	112.22
34	1.11	85	29.44	135	57.22	185	85.	235	112.78
35	1.67	86	30.	136	57.78	186	85.56	236	113.33
36	2.22	87	30.56	137	58.33	187	86.11	237	113.89
37	2.78	88	31.11	138	58.89	188	86.67	238	114.44
38	3.33	89	31.67	139	59.44	189	87.22	239	115.
39	3.89	90	32.22	140	60.	190	87.78	240	115.56
40	4.44	91	32.78	141	60.56	191	88.33	241	116.11
41	5.	92	33.33	142	61.11	192	88.89	242	116.67
42	5.56	93	33.89	143	61.67	193	89.44	243	117.22
43	6.11	94	34.44	144	62.22	194	90.	244	117.78
44	6.67	95	35.	145	62.78	195	90.56	245	118.33
45	7.22	96	35.56	146	63.33	196	91.11	246	118.89
46	7.78	97	36.11	147	63.89	197	91.67	247	119.44
47	8.33	98	36.67	148	64.44	198	92.22	248	120.
48	8.89	99	37.22	149	65.	199	92.78	249	120.56
49	9.44	100	37.78	150	65.56	200	93.33	250	121.11
50	10.								

Calibration of Glass Measuring Apparatus

Apparent weight in air of distilled water filling a 100-cc. flask at different temperatures. Barometer (corrected for temperature) 760 mm. Coefficient of cubical expansion of glass taken as 0.000025. It is assumed that the weights used are brass and that water and air (one-half saturated with moisture) are at the same temperature.

Temperature*	Flask holds 100 cc. at 15° C.	Flask holds 100 cc. at 20° C.	Flask holds 100 cc. at 25° C. U. S. P. Standard	Correction for 10 mm. Barometer above or below 760 mm. †
15° C.	99.8050	99.7925	99.7801	0.00142
16° C.	99.7923	99.7798	99.7673	0.00141
17° C.	99.7784	99.7659	99.7535	0.00141
18° C.	99.7634	99.7510	99.7385	0.00140
19° C.	99.7474	99.7349	99.7224	0.00140
20° C.	99.7302	99.7177	99.7052	0.00140
21° C.	99.7120	99.6995	99.6870	0.00139
22° C.	99.6927	99.6802	99.6678	0.00139
23° C.	99.6724	99.6599	99.6475	0.00138
24° C.	99.6511	99.6386	99.6262	0.00138
25° C.	99.6288	99.6164	99.6039	0.00137
26° C.	99.6056	99.5931	99.5807	0.00137
27° C.	99.5813	99.5689	99.5564	0.00136
28° C.	99.5562	99.5438	99.5313	0.00136
29° C.	99.5302	99.5177	99.5053	0.00136
30° C.	99.5032	99.4908	99.4783	0.00135
31° C.	99.4754	99.4630	99.4505	0.00135
32° C.	99.4467	99.4343	99.4218	0.00134
33° C.	99.4172	99.4048	99.3924	0.00134
34° C.	99.3868	99.3744	99.3620	0.00133
35° C.	99.3557	99.3433	99.3309	0.00133

* If temperature of air is above that of the water, add for each degree centigrade, 0.00041; if below, subtract the same amount.

† Barometer correction additive if reading is below 760 mm., subtractive if above.

NOTE—When extreme exactness is required the counterpoise of the flask should be of the same kind of glass as that of which the flask is made.

Weight and Volume Relations

Specific gravity true 25° C. / 25° C.	Specific volume	Weight of 1 U. S. gallon in pounds avoirdupois in air	Weight of 100 fluidounces in ounces avoirdupois	Weight of 1 fluidounce in grains	Volume in U. S. gallons of 100 lbs. avoirdupois	Volume in fluidounces of 100 ozs. avoirdupois	Volume in fluidounces of 1000 grains
0.70	1.4286	5.816	72.70	318.0	17.195	137.56	3.144
0.71	1.4085	5.899	73.74	322.6	16.953	135.62	3.100
0.72	1.3889	5.982	74.78	327.1	16.717	133.73	3.057
0.73	1.3699	6.065	75.82	331.7	16.487	131.90	3.015
0.74	1.3514	6.149	76.86	336.2	16.264	130.11	2.974
0.75	1.3333	6.232	77.90	340.8	16.047	128.38	2.934
0.76	1.3158	6.315	78.94	345.3	15.836	126.69	2.896
0.77	1.2987	6.398	79.98	349.9	15.630	125.04	2.858
0.78	1.2821	6.481	81.02	354.5	15.429	123.43	2.821
0.79	1.2658	6.565	82.06	359.0	15.233	121.87	2.786
0.80	1.2500	6.648	83.10	363.6	15.043	120.34	2.751
0.81	1.2346	6.731	84.14	368.1	14.857	118.85	2.717
0.82	1.2195	6.814	85.18	372.7	14.675	117.40	2.684
0.83	1.2048	6.897	86.22	377.2	14.496	115.99	2.651
0.84	1.1905	6.981	87.26	381.8	14.325	114.60	2.620
0.85	1.1765	7.064	88.30	386.3	14.157	113.25	2.589
0.86	1.1628	7.147	89.34	390.9	13.992	111.93	2.559
0.87	1.1494	7.230	90.38	395.4	13.831	110.65	2.529
0.88	1.1364	7.314	91.42	400.0	13.673	109.39	2.500
0.89	1.1236	7.397	92.46	404.5	13.520	108.16	2.472
0.90	1.1111	7.480	93.50	409.1	13.369	106.95	2.445
0.91	1.0989	7.563	94.54	413.6	13.222	105.78	2.418
0.92	1.0870	7.646	95.58	418.2	13.078	104.62	2.391
0.93	1.0753	7.730	96.62	422.7	12.937	103.50	2.366
0.94	1.0638	7.813	97.66	427.3	12.799	102.40	2.341
0.95	1.0526	7.896	98.70	431.8	12.666	101.32	2.316
0.96	1.0417	7.979	99.74	436.4	12.532	100.26	2.292
0.97	1.0309	8.063	100.78	440.9	12.403	99.23	2.268
0.98	1.0204	8.146	101.82	445.5	12.276	98.21	2.245
0.99	1.0101	8.229	102.86	450.0	12.152	97.22	2.222
1.00	1.0000	8.312	103.90	454.6	12.031	96.24	2.200
1.02	0.9804	8.479	105.98	463.7	11.794	94.36	2.157
1.04	0.9615	8.645	108.06	472.8	11.567	92.54	2.115
1.06	0.9434	8.812	110.14	481.9	11.349	90.79	2.075
1.08	0.9259	8.978	112.22	491.0	11.138	89.11	2.037
1.10	0.9091	9.144	114.31	500.1	10.936	87.49	2.000
1.12	0.8929	9.311	116.39	509.2	10.740	85.92	1.964
1.14	0.8772	9.477	118.47	518.3	10.552	84.41	1.929
1.16	0.8621	9.644	120.55	527.4	10.370	82.96	1.896
1.18	0.8475	9.810	122.63	536.5	10.194	81.55	1.864

Weight and Volume Relations—*Continued*

Specific gravity true 25° C./25° C.	Specific volume	Weight of 1 U. S. gallon in pounds avoirdupois in air	Weight of 100 fluidounces in ounces avoirdupois	Weight of 1 fluidounce in grains	Volume in U. S. gallons of 100 lbs. avoirdupois	Volume in fluidounces of 100 ozs. avoirdupois	Volume in fluidounces of 1000 grains
1.20	0.8333	9.977	124.71	545.6	10.024	80.19	1.833
1.22	0.8197	10.143	126.79	554.7	9.859	78.87	1.803
1.24	0.8065	10.309	128.87	563.8	9.700	77.60	1.774
1.26	0.7937	10.476	130.95	572.9	9.546	76.37	1.746
1.28	0.7813	10.642	133.03	582.0	9.396	75.17	1.718
1.30	0.7692	10.809	135.11	591.1	9.252	74.01	1.692
1.32	0.7576	10.975	137.19	600.2	9.111	72.89	1.666
1.34	0.7463	11.142	139.27	609.3	8.975	71.80	1.641
1.36	0.7353	11.308	141.35	618.4	8.843	70.75	1.617
1.38	0.7246	11.475	143.43	627.5	8.715	69.72	1.594
1.40	0.7143	11.641	145.51	636.6	8.590	68.72	1.571
1.42	0.7042	11.807	147.59	645.7	8.469	67.75	1.549
1.44	0.6944	11.974	149.67	654.8	8.352	66.81	1.527
1.46	0.6849	12.140	151.75	663.9	8.237	65.90	1.506
1.48	0.6757	12.307	153.83	673.0	8.126	65.01	1.486
1.50	0.6667	12.473	155.92	682.1	8.017	64.13	1.466
1.52	0.6579	12.640	158.00	691.2	7.912	63.29	1.447
1.54	0.6494	12.806	160.08	700.3	7.809	62.47	1.428
1.56	0.6410	12.973	162.16	709.4	7.709	61.67	1.410
1.58	0.6329	13.139	164.24	718.5	7.611	60.89	1.392
1.60	0.6250	13.305	166.32	727.6	7.516	60.13	1.374
1.62	0.6173	13.472	168.40	736.7	7.423	59.38	1.357
1.64	0.6098	13.638	170.48	745.8	7.332	58.66	1.341
1.66	0.6024	13.805	172.56	754.9	7.244	57.95	1.325
1.68	0.5952	13.971	174.64	764.1	7.158	57.26	1.309
1.70	0.5882	14.138	176.72	773.2	7.073	56.59	1.293
1.72	0.5814	14.304	178.80	782.3	6.991	55.93	1.278
1.74	0.5747	14.470	180.88	791.4	6.911	55.29	1.264
1.76	0.5682	14.637	182.96	800.5	6.832	54.66	1.249
1.78	0.5618	14.803	185.04	809.6	6.755	54.04	1.235
1.80	0.5556	14.970	187.12	818.7	6.680	53.44	1.222
1.82	0.5495	15.136	189.20	827.8	6.607	52.85	1.208
1.84	0.5435	15.302	191.28	836.9	6.535	52.28	1.195
1.86	0.5376	15.469	193.36	846.0	6.465	51.72	1.182
1.88	0.5319	15.636	195.44	855.1	6.396	51.17	1.170
1.90	0.5263	15.802	197.53	864.2	6.328	50.63	1.157
1.92	0.5208	15.968	199.61	873.3	6.262	50.10	1.145
1.94	0.5155	16.135	201.69	882.4	6.198	49.58	1.133
1.96	0.5102	16.301	203.77	891.5	6.135	49.08	1.122
1.98	0.5051	16.468	205.85	900.6	6.073	48.58	1.110
2.00	0.5000	16.634	207.93	909.7	6.012	48.09	1.100

Equivalents of Weights and Measures, See page 916.

Metric, Avoirdupois and Apothecaries

NOTE—The values, given for the relation of weight to measure and *vice versa*, are for water at the temperature of 4° C. (39.2° F.) *in vacuo*. For ordinary, practical purposes these values may be used without correction.

Weights						Metric Weight and Measure	Measures		
Grains	Apothecaries		Avoirdupois				Fluid		Fluid-ounces and fractions
	ozs.	grains	lbs.	ozs.	grains	Gm. or cc.*	ounces	minims	
15432.4	32	72.4	2	3	119.9	1000	33	391.1	33.815
15360.0	32	...	2	3	47.5	995.311	33	314.9	33.656
15060.5	31	180.5	2	2	185.5	975.906	33	....	33
15046.5	31	166.5	2	2	171.5	975	32	465.3	32.969
14880.0	31	...	2	2	5.0	964.208	32	290.1	32.604
14660.7	30	260.7	2	1	223.2	950	32	59.5	32.124
14604.1	30	204.1	2	1	166.6	946.333	32	....	32
14400.0	30	...	2	..	400.0	933.104	31	265.2	31.553
14274.9	29	354.9	2	..	274.9	925	31	133.7	31.279
14147.8	29	227.8	2	..	147.8	916.760	31	....	31
14000.0	29	80.0	2	..	....	907.185	30	324.6	30.676
13920.0	29	...	1	15	357.5	902.001	30	240.4	30.501
13889.1	28	449.1	1	15	326.6	900	30	207.9	30.433
13691.4	28	251.4	1	15	128.9	887.187	30	....	30
13562.5	28	122.5	1	15	....	878.835	29	344.4	29.718
13503.3	28	63.3	1	14	378.3	875	29	282.2	29.588
13440.0	28	...	1	14	315.0	870.897	29	215.6	29.449
13235.0	27	275.0	1	14	110.0	857.614	29	....	29
13125.0	27	165.0	1	14	....	850.486	28	364.3	28.759
13117.5	27	157.5	1	13	430.0	850	28	356.4	28.742
12960.0	27	...	1	13	272.5	839.794	28	190.8	28.397
12778.6	26	298.6	1	13	91.1	828.041	28	....	28
12731.7	26	251.7	1	13	44.2	325	27	430.6	27.897
12687.5	26	207.5	1	13	....	822.136	27	384.1	27.800
12480.0	26	...	1	12	230.0	808.690	27	165.9	27.346
12345.9	25	345.9	1	12	95.9	800	27	24.9	27.052
12322.3	25	322.3	1	12	72.3	798.469	27	....	27
12250.0	25	250.0	1	12	....	793.787	26	404.0	26.842
12000.0	25	...	1	11	187.5	777.587	26	141.1	26.294
11960.1	24	440.1	1	11	147.6	775	26	99.1	26.206
11865.9	24	345.9	1	11	53.4	768.896	26	....	26
11812.5	24	292.5	1	11	....	765.437	25	423.8	25.883
11574.3	24	54.3	1	10	199.3	750	25	173.3	25.361
11520.0	24	...	1	10	145.0	746.484	25	116.2	25.242
11409.5	23	369.5	1	10	34.5	739.323	25	....	25
11375.0	23	335.0	1	10	....	737.088	24	443.7	24.924
11188.5	23	148.5	1	9	251.0	725	24	247.5	24.516
11040.0	23	...	1	9	102.5	715.380	24	91.4	24.190
10953.1	22	393.1	1	9	15.6	709.750	24	....	24
10937.5	22	377.5	1	9	....	708.738	23	463.6	23.966

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—*Continued*

Weights						Metric Weight and Measure	Measures		
Grains	Apothecaries		Avoirdupois				Fluid		Fluid-ounces and fractions
	ozs.	grains	lbs.	ozs.	grains	Gm. or cc.*	ounces	minims	
10802.6	22	242.6	1	8	302.6	700	23	321.7	23.670
10560.0	22	...	1	8	60.0	684.277	23	66.5	23.139
10500.0	21	420.0	1	8	....	680.389	23	3.4	23.007
10496.7	21	416.7	1	7	434.2	680.177	23	....	23
10416.8	21	336.8	1	7	354.3	675	22	396.0	22.825
10080.0	21	...	1	7	17.5	653.173	22	41.7	22.087
10062.5	20	462.5	1	7	....	652.039	22	23.3	22.049
10040.4	20	440.4	1	6	415.4	650.604	22	....	22
10031.0	20	431.0	1	6	406.0	650	21	470.2	21.980
9645.2	20	45.2	1	6	20.2	625	21	64.4	21.134
9625.0	20	25.0	1	6	....	623.690	21	43.2	21.090
9600.0	20	...	1	5	412.5	622.070	21	16.8	21.035
9584.0	19	464.0	1	5	396.5	621.031	21	....	21
9259.4	19	139.4	1	5	71.9	600	20	138.6	20.289
9187.5	19	67.5	1	5	....	595.340	20	63.0	20.131
9127.6	19	7.6	1	4	377.6	591.458	20	....	20
9120.0	19	...	1	4	370.0	590.966	19	472.0	19.983
8873.6	18	233.6	1	4	123.6	575	19	212.9	19.444
8750.0	18	110.0	1	4	....	566.991	19	82.8	19.173
8671.2	18	31.2	1	3	358.7	561.885	19	....	19
8640.0	18	...	1	3	327.5	559.863	18	447.2	18.932
8487.8	17	327.8	1	3	175.3	550	18	287.1	18.598
8312.5	17	152.5	1	3	....	538.641	18	102.7	18.214
8214.8	17	54.8	1	2	339.8	532.312	18	....	18
8160.0	17	...	1	2	285.0	528.759	17	422.3	17.880
8102.0	16	422.0	1	2	227.0	525	17	361.3	17.753
7875.0	16	195.0	1	2	....	510.291	17	122.5	17.255
7758.5	16	78.5	1	1	321.0	502.739	17	....	17
7716.2	16	36.2	1	1	278.7	500	16	435.6	16.907
7680.0	16	...	1	1	242.5	497.656	16	397.5	16.828
7437.5	15	237.5	1	1	....	481.942	16	142.4	16.297
7330.4	15	130.4	1	..	330.4	475	16	29.8	16.062
7302.1	15	102.1	1	..	302.1	473.167	16	....	16
7200.0	15	...	1	..	200.0	466.552	15	372.6	15.776
7000.0	14	280.0	1	..	....	453.592	15	162.3	15.338
6944.6	14	224.6	..	15	382.1	450	15	104.0	15.217
6845.7	14	125.7	..	15	283.2	443.594	15	....	15
6720.0	14	...	..	15	157.5	435.449	14	347.8	14.725
6562.5	13	322.5	..	15	....	425.243	14	182.2	14.379
6558.8	13	318.8	..	14	433.8	425	14	178.2	14.371
6389.3	13	149.3	..	14	264.3	414.021	14	....	14
6240.0	13	...	..	14	115.0	404.345	13	322.9	13.673

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—*Continued*

Weights						Metric Weight and Measure	Measures		
Grains	Apothecaries		Avoirdupois				Fluid		Fluid-ounces and fractions
	ozs.	grains	lbs.	ozs.	grains	Gm. or cc.*	ounces	minims	
6172.9	12	412.9	..	14	47.9	400	13	252.4	13.526
6125.0	12	365.0	..	14	....	396.893	13	202.0	13.421
5932.9	12	172.9	..	13	245.4	384.448	13	....	13
5787.1	12	27.1	..	13	99.6	375	12	326.6	12.681
5760.0	12	...	..	13	72.5	373.242	12	298.1	12.621
5687.5	11	407.5	..	13	....	368.544	12	221.9	12.462
5476.6	11	196.6	..	12	226.6	354.875	12	....	12
5401.3	11	121.3	..	12	151.3	350	11	400.8	11.835
5280.0	11	...	..	12	30.0	342.138	11	273.3	11.569
5250.0	10	450.0	..	12	....	340.194	11	241.7	11.504
5020.2	10	220.2	..	11	207.7	325.302	11	....	11
5015.5	10	215.5	..	11	203.0	325	10	475.1	10.990
4812.5	10	12.5	..	11	....	311.845	10	261.6	10.545
4800.0	10	...	..	10	425.0	311.035	10	248.4	10.518
4629.7	9	309.7	..	10	254.7	300	10	69.3	10.144
4563.8	9	243.8	..	10	188.8	295.729	10	....	10
4375.0	9	55.0	..	10	....	283.495	9	281.4	9.586
4320.0	9	...	..	9	382.5	279.931	9	223.6	9.466
4244.0	8	403.9	..	9	306.4	275	9	143.5	9.299
4107.4	8	267.4	..	9	169.9	266.156	9	....	9
3937.5	8	97.5	..	9	....	255.146	8	301.3	8.628
3858.1	8	18.1	..	8	358.1	250	8	217.8	8.454
3840.0	8	...	..	8	340.0	248.828	8	198.7	8.414
3651.0	7	291.0	..	8	151.0	236.583	8	....	8
3500.0	7	140.0	..	8	....	226.796	7	321.1	7.669
3472.3	7	112.3	..	7	409.8	225	7	292.0	7.608
3360.0	7	...	..	7	297.5	217.724	7	173.9	7.362
3194.7	6	314.7	..	7	132.2	207.010	7	....	7
3086.5	6	206.5	..	7	24.0	200	6	366.2	6.763
3062.5	6	182.5	..	7	....	198.447	6	341.0	6.710
2880.0	6	...	..	6	255.0	186.621	6	149.0	6.311
2738.3	5	338.3	..	6	113.3	177.437	6	....	6
2700.7	5	300.7	..	6	75.7	175	5	440.4	5.918
2625.0	5	225.0	..	6	....	170.097	5	360.9	5.752
2400.0	5	...	..	5	212.5	155.517	5	124.2	5.259
2314.9	4	394.9	..	5	127.4	150	5	34.7	5.072
2281.9	4	361.9	..	5	94.4	147.865	5	....	5
2187.5	4	267.5	..	5	....	141.748	4	380.7	4.793
1929.0	4	9.0	..	4	179.0	125	4	108.9	4.227
1920.0	4	...	..	4	170.0	124.414	4	99.4	4.207
1825.5	3	385.5	..	4	75.5	118.292	4	....	4
1750.0	3	310.0	..	4	....	113.398	3	400.6	3.835

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—Continued

Weights							Metric Weight and Measure	Measures		
Grains	Apothecaries		Avoirdupois					Fluid		Fluid-ounces and fractions
	ozs.	grains	lbs.	ozs.	grains		Gm. or cc.*	ounces	minims	
1543.2	3	103.2	..	3	230.7		100	3	183.1	3.381
1440.0	3	...	..	3	127.5		93.310	3	74.5	3.155
1388.9	2	428.9	..	3	76.4		90	3	20.8	3.043
1369.1	2	409.1	..	3	56.6		88.719	3	....	3
1312.5	2	352.5	..	3	....		85.049	2	420.4	2.876
1234.6	2	274.6	..	2	359.6		80	2	338.5	2.705
1157.4	2	197.4	..	2	282.4		75	2	257.3	2.536
1080.3	2	120.3	..	2	205.3		70	2	176.2	2.367
960.0	2	...	..	2	85.0		62.207	2	49.7	2.104
925.9	1	445.9	..	2	50.9		60	2	13.9	2.029
912.8	1	432.8	..	2	37.8		59.146	2	....	2
875.0	1	395.0	..	2	....		56.699	1	440.3	1.917
771.6	1	291.6	..	1	334.1		50	1	331.5	1.691
617.3	1	137.3	..	1	179.8		40	1	169.2	1.353
480.0	1	...	..	1	42.5		31.1035	1	24.9	1.052
463.0	..	...	..	1	25.5		30	1	6.9	1.014
456.380	..	...	..	1	18.88		29.5729	1	....	1
437.5	..	...	..	1	....		28.350	..	460.15	0.959
385.8	..	...	..	..	....		25	..	405.78	0.845
308.6	..	...	..	..	....		20	..	324.62	0.676
154.3	..	...	..	..	....		10	..	162.31	0.338
15.4324	..	...	..	..	....		1	..	16.23	0.0338
1	..	...	..	..	....		0.06480	..	1.0517	0.0022
0.9508	..	...	..	..	....		0.06161	.	1	0.0021

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

NOTE—The tables of exact equivalents, pages 913 to 918, should not be confused with the table of *approximate* dose equivalents which appears on page 3 and on the rear fly leaf. The latter tables are provided only as a convenience to physicians for prescribing.

For the conversion of specific quantities in a prescription which requires compounding or in converting pharmaceutical formulas, *exact* equivalents must be used.

Equivalents of Weights and Measures—*Continued*

From 480 grains down

Grains	Metric Weight and Measure Gm. or cc.*	Minims (of Water at 4° C.)	Grains	Metric Weight and Measure Gm. or cc.*	Minims (of Water at 4° C.)
480 [1 ℥	31.103	504.8	240 [4 ʒ	15.552	252.4
478.4	31	503.2	231.5	15	243.5
475.4	30.805	500	228.2	14.786	240.0
463.0	30	486.9	218.75 [½ av. oz.	14.175	230.1
456.4	29.573	480 [1 f℥	216.1	14	227.2
450	29.160	473.3	210	13.608	220.9
447.5	29	470.7	200.6	13	211.0
437.5 [1 av. oz.	28.350	460.2	199.7	12.938	210.0
432.1	28	454.5	185.2	12	194.8
427.9	27.725	450			
420 [7 ʒ	27.216	441.7	180 [3 ʒ	11.664	189.3
416.7	27	438.2	171.1	11.090	180.0
401.2	26	422.0	169.8	11	178.5
399.3	25.876	420	154.3	10	162.3
390	25.272	410.2	150	9.720	157.8
385.8	25	405.8	142.6	9.242	150.0
380.3	24.644	400	138.9	9	146.1
370.8	24.028	390	123.5	8	129.8
370.4	24	389.5			
360 [6 ʒ	23.328	378.6	120 [2 ʒ	7.776	126.2
354.9	23	373.3	114.1	7.393	120.0
342.3	22.180	360	109.375 [¼ av. oz.	7.087	115.0
339.5	22	357.1	108.0	7	113.6
330	21.384	347.1	100	6.480	105.2
324.1	21	340.9	95.1	6.161	100.0
313.8	20.331	330	92.6	6	97.4
308.6	20	324.6	80	5.184	84.1
			77.2	5	81.2
			76.1	4.929	80.0
			61.7	4	64.9
300 [5 ʒ	19.440	315.5	60 [1 ʒ	3.888	63.1
293.2	19	308.4	57.0	3.697	60.0
285.2	18.483	300	54.6875 [⅛ av. oz.	3.544	57.5
277.8	18	292.2	47.5	3.081	50.0
270	17.496	284.0	50	3.240	52.6
262.4	17	275.9	46.3	3	48.7
256.7	16.635	270	42.8	2.772	45.0
246.9	16	259.7	40	2.592	42.1
			38.0	2.464	40.0
			33.3	2.156	35.0
			30.9	2	32.5

* NOTE—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Weights and Measures—*Continued*

From 30 grains down

Grains	Metric Weight and Measure Gm. or cc.*	Minims (of Water at 4° C.)
30 [$^1/_2$ ʒ	1.944	31.55
28.52	1.848	30
23.77	1.540	25
20	1.296	21.04
19.02	1.232	20
15.4324	1	16.23
15	0.972	15.78
14.26	0.924	15
14	0.907	14.72
13.31	0.863	14
13	0.842	13.67
12.36	0.801	13
12	0.778	12.63
11.41	0.739	12
11	0.713	11.57
10.46	0.678	11
10	0.648	10.52
9.51	0.616	10
9	0.583	9.46
8.56	0.554	9
8	0.518	8.41
7.72	0.5	8.12
7.61	0.493	8
7	0.454	7.37
6.66	0.431	7
6	0.389	6.31
5.70	0.370	6
5	0.324	5.26
4.75	0.308	5
4	0.259	4.20
3.80	0.246	4
3	0.194	3.15
2.85	0.185	3
2	0.130	2.11
1.90	0.123	2
1	0.06480	1.0518
0.9508	0.06161	1

Weights from 5 grains down

Milligrams (mg.)	Grains
324 mg.	5
292 mg.	$4^1/_2$
259 mg.	4
227 mg.	$3^1/_2$
194 mg.	3
162 mg.	$2^1/_2$
130 mg.	2
97 mg.	$1^1/_2$
65 mg.	1
60.7 mg.	$^{15}/_{16}$
58.3 mg.	$^9/_{10}$
56.7 mg.	$^7/_8$
52.6 mg.	$^{13}/_{16}$
51.8 mg.	$^4/_5$
48.6 mg.	$^3/_4$
44.5 mg.	$^{11}/_{16}$
40.5 mg.	$^5/_8$
36.4 mg.	$^9/_{16}$
32.4 mg.	$^1/_2$
28.3 mg.	$^7/_{16}$
25.9 mg.	$^2/_5$
24.3 mg.	$^3/_8$
20.2 mg.	$^5/_{16}$
16.2 mg.	$^1/_4$
12.1 mg.	$^3/_{16}$
8.1 mg.	$^1/_8$
4.0 mg.	$^1/_{16}$
3.2 mg.	$^1/_{20}$
2.6 mg.	$^1/_{25}$
2.2 mg.	$^1/_{30}$
1.8 mg.	$^1/_{36}$
1.6 mg.	$^1/_{40}$
1.3 mg.	$^1/_{50}$
1.1 mg.	$^1/_{60}$
1.0 mg.	$^1/_{64}$
0.6 mg.	$^1/_{100}$
0.5 mg.	$^1/_{128}$
0.4 mg.	$^1/_{160}$
0.3 mg.	$^1/_{216}$
0.2 mg.	$^1/_{320}$
0.1 mg.	$^1/_{640}$

* Note—By the "cc." in this table is meant the one-thousandth part of the liter or a milliliter (ml.).

Equivalents of Linear Measures

Metric to English

Centimeters	Inches	Centimeters	Inches	Millimeters	Inches in decimal fractions	Inches in 32ds.
150	59.06	55	21.65	25.4	1	$^{32}/_{32}$
145	57.09	53.3	21	25	0.98	...
140	55.12	50.8	20	24.0	0.94	...
139.7	**55**	**50**	19.69	23.8	0.94	$^{30}/_{32}$
135	53.15	48.3	**19**	23.0	0.91	$^{29}/_{32}$
130	51.18	45.7	**18**	22.2	0.88	$^{28}/_{32}$
127.0	**50**	**45**	17.72	22.0	0.87	...
125	49.21	43.2	**17**	21.0	0.83	...
120	47.24	40.6	**16**	20.6	0.81	$^{26}/_{32}$
115	45.28	**40**	15.75	20	0.79	...
114.3	**45**	38.1	**15**	19.1	0.75	$^{24}/_{32}$
110	43.31	35.6	**14**	19.0	0.75	...
105	41.34	**35**	13.78	18.0	0.71	...
101.6	**40**	33.0	**13**	17.5	0.69	$^{22}/_{32}$
100	39.37	30.5	**12**	17.0	0.67	...
99.1	**39**	**30**	11.81	16.0	0.63	...
96.5	**38**	27.9	**11**	15.9	0.62	$^{20}/_{32}$
95	37.40	25.4	**10**	15	0.59	...
94.0	**37**	**25**	9.84	14.3	0.56	$^{18}/_{32}$
91.4	**36**	22.9	**9**	14.0	0.55	...
90	35.43	20.3	**8**	13.0	0.51	...
88.9	**35**	**20**	7.87	12.7	0.50	$^{16}/_{32}$
86.4	**34**	17.8	**7**	12.0	0.47	...
85	33.46	15.2	**6**	11.1	0.44	$^{14}/_{32}$
83.8	**33**	**15**	5.91	11.0	0.43	...
81.3	**32**	12.7	**5**	**10**	0.39	...
80	31.50	10.2	**4**	9.5	0.38	$^{12}/_{32}$
78.7	**31**	**10**	3.94	**9**	0.35	...
76.2	**30**	**9**	3.54	8.7	0.34	$^{11}/_{32}$
75	29.53	**8**	3.15	**8**	0.31	...
73.7	**29**	7.6	**3**	7.9	0.31	$^{10}/_{32}$
71.1	**28**	**7**	2.76	7.1	0.28	$^{9}/_{32}$
70	27.56	**6**	2.36	**7**	0.28	...
68.6	**27**	5.1	**2**	6.4	0.25	$^{8}/_{32}$
66.0	**26**	**5**	1.97	**6**	0.24	...
65	25.59	**4**	1.57	5.6	0.22	$^{7}/_{32}$
63.5	**25**	**3**	1.18	**5**	0.20	...
61.0	**24**	2.54	**1**	4.8	0.19	$^{6}/_{32}$
60	23.62	**2**	0.79	**4**	0.16	...
58.4	**23**	**1**	0.39	3.2	0.12	$^{4}/_{32}$
55.9	**22**			**3**	0.12	...
				2.4	0.09	$^{3}/_{32}$
				2	0.08	...
				1.6	0.06	$^{2}/_{32}$
				1	0.04	...
				0.8	0.03	$^{1}/_{32}$
				0.1	0.0039	...

Equivalents of Linear Measures

English to Metric

Feet	Meters	Centimeters	Inches	Milli-meters	Inches in fractions	Inches decimal fractions	Millimeters
25	7.620	762.0	34	863.6	16/16	1.000	25.40
24	7.315	731.5	33	838.2	15/16	0.9375	23.81
23	7.010	701.0	32	812.8	7/8	0.8750	22.22
22	6.706	670.6	31	787.4	13/16	0.8125	20.64
21	6.401	640.1	30	762.0	6/8	0.7500	19.05
20	6.096	609.6	29	736.6	11/16	0.6875	17.46
19	5.791	579.1	28	711.2	5/8	0.6250	15.88
18	5.486	548.6	27	685.8	9/16	0.5625	14.29
17	5.182	518.2	26	660.4	1/2	0.5000	12.70
16	4.877	487.7	25	635.0	7/16	0.4375	11.11
15	4.572	457.2	24	609.6	3/8	0.3750	9.52
14	4.267	426.7	23	584.2	5/16	0.3125	7.94
13	3.962	396.2	22	558.8	1/4	0.2500	6.35
12	3.658	365.8	21	533.4	3/16	0.1875	4.76
11	3.353	335.3	20	508.0	1/8	0.1250	3.18
10	3.048	304.8	19	482.6	1/16	0.0625	1.59
9	2.743	274.3	18.	457.2	1/32	0.03125	0.79
8	2.438	243.8	17	431.8	1/64	0.01562	0.40
7	2.134	213.4	16	406.4	1/100	0.01000	0.25
6	1.829	182.9	15	381.0	1/200	0.00500	0.127
5	1.524	152.4	14	355.6	1/320	0.00312	0.08
4	1.219	121.9	13	330.2	2/3	0.667	16.93
3	0.9144	91.44	12	304.8	1/3	0.333	8.47
2	0.6096	60.96	11	279.4	4/5	0.800	20.32
1	0.3048	30.48	10	254.0	3/5	0.600	15.24
0.9	0.2743	27.43	9	228.6	2/5	0.400	10.16
0.8	0.2438	24.38	8	203.2	1/10	0.100	2.54
0.7	0.2134	21.34	7	177.8			
0.6	0.1829	18.29	6	152.4			
0.5	0.1524	15.24	5	127.0			
0.4	0.1219	12.19	4	101.6			
0.3	0.0914	9.144	3	76.2			
0.2	0.0610	6.096	2	50.8			
0.1	0.0305	3.048	1	25.4			

Table for Converting Metric Quantities in Pharmaceutical Processes to Quantities in the Avoirdupois Weights

Table I—Grams to grains, etc. (Product measured)

Grams per liter	Grains per fluidounce		Grains, etc., per pint		Grains, etc., per gallon		
	Ounces avoir.	Grains	Ounces avoir.	Grains	Pounds avoir.	Ounces avoir.	Grains
1	..	0.46	..	7.3	..	..	58.4
2	..	0.91	..	14.6	..	..	116.8
3	..	1.37	..	21.9	..	..	175.3
4	..	1.83	..	29.2	..	..	233.7
5	..	2.28	..	36.5	..	..	292.1
6	..	2.74	..	43.8	..	..	350.5
7	..	3.19	..	51.1	..	..	408.9
8	..	3.65	..	58.4	..	1	30.0
9	..	4.10	..	65.7	..	1	88.0
10	..	4.56	..	73.0	..	1	147.0
20	..	9.13	..	146.0	..	2	293.0
30	..	13.69	..	219.1	..	4	3.0
40	..	18.26	..	292.1	..	5	149.0
50	..	22.82	..	365.1	..	6	296.0
60	..	27.38	1	0.6	..	8	5.0
70	..	31.95	1	73.7	..	9	152.0
80	..	36.51	1	146.7	..	10	299.0
90	..	41.08	1	219.7	..	12	8.0
100	..	45.64	1	292.7	..	13	154.0
200	..	91.28	3	148.0	1	10	309.0
300	..	136.92	5	3.0	2	8	26.0
400	..	182.56	6	296.0	3	5	180.0
500	..	228.20	8	151.0	4	2	334.0
600	..	273.84	10	6.0	5	0	51.0
700	..	319.47	11	299.0	5	13	204.0
800	..	365.11	13	154.0	6	10	360.0
900	..	410.75	15	10.0	7	8	76.0
1000	1	18.89	16	302.0	8	5	231.0

Example: To make 1 gallon.

Camphor and Soap Liniment

Hard Soap	60 Gm.	(Table I)	8 oz.	5 grs.
Camphor	45 Gm.	" " { 40 Gm....	5 oz.	149 grs.
		5 Gm....		292.1 grs. }
Rosemary Oil	10 cc.	(Table II)	1 fl. oz.	134 min.
Alcohol	700 cc.	" "	5 pts. 9 fl. oz.	288 min.
Water, sufficient to make	1000 cc.		or 1 gallon	

Table for Converting Metric Quantities in Pharmaceutical Processes to Quantities in Apothecaries Measures

Table II—Cc. to minims, etc. (Product measured)

Cc. per liter	Minims per fluidounce	Minims, etc., per pint		Minims, etc., per gallon		
		Fl. oz.	Minims	Pints	Fl. oz.	Minims
1	0.48	..	7.68	..	..	61
2	0.96	..	15.36	..	..	123
3	1.44	..	23.04	..	..	184
4	1.92	..	30.72	..	..	246
5	2.40	..	38.40	..	..	307
6	2.88	..	46.09	..	..	369
7	3.36	..	53.76	..	..	430
8	3.84	..	61.44	..	1	12
9	4.32	..	69.12	..	1	73
10	4.80	..	76.80	..	1	134
20	9.60	..	153.60	..	2	269
30	14.40	..	230.40	..	3	403
40	19.20	..	307.20	..	5	58
50	24.00	..	384.00	..	6	192
60	28.80	..	460.80	..	7	326
70	33.60	1	57.60	..	8	461
80	38.40	1	134.40	..	10	115
90	43.20	1	211.20	..	11	250
100	48.00	1	288.00	..	12	384
200	96.00	3	96.00	1	9	288
300	144.00	4	384.00	2	6	192
400	192.00	6	192.00	3	3	96
500	240.00	8	....	4	..	...
600	288.00	9	288.00	4	12	384
700	336.00	11	96.00	5	9	288
800	384.00	12	384.00	6	6	192
900	432.00	14	192.00	7	3	96
1000	480.00	16	....	8	..	...

Table for Converting Metric Quantities in Pharmaceutical Processes to Apothecaries and Avoirdupois Weights

Table III—Parts per 1000 to grains, etc., per pound avoirdupois

Grams per kilogram	Grains and apothecaries ounces per pound avoirdupois		Grains and ounces avoirdupois per pound avoirdupois	
	Ounces	Grains	Ounces	Grains
1	..	7	..	7.0
2	..	14	..	14.0
3	..	21	..	21.0
4	..	28	..	28.0
5	..	35	..	35.0
6	..	42	..	42.0
7	..	49	..	49.0
8	..	56	..	56.0
9	..	63	..	63.0
10	..	70	..	70.0
20	..	140	..	140.0
30	..	210	..	210.0
40	..	280	..	280.0
50	..	350	..	350.0
60	..	420	..	420.0
70	1	10	1	52.5
80	1	80	1	122.5
90	1	150	1	192.5
100	1	220	1	262.5
200	2	440	3	87.5
300	4	180	4	350.0
400	5	400	6	175.0
500	7	140	8	...
600	8	360	9	262.5
700	10	100	11	87.5
800	11	320	12	350.0
900	13	60	14	175.0
1000	14	280	16	...

Example: To make 1 pound avoirdupois.

Camphor Liniment

Camphor................	200 Gm.	(Table III).............	3 oz.	87.5 grs.
Cottonseed Oil...........	800 Gm.	" "	12 oz.	350.0 grs.
To make............	1000 Gm.		or 1 pound avoirdupois	

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